FORMS OF DISCIPLINARY FRAGMENTATION: HOLISTIC HEALTHCARE AND THE CATEGORICAL DIVISION OF ACADEMIC LABOR

BY

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DISSERTATION

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Abstract

This dissertation approaches holistic healthcare as a problem of disciplinarity in that it articulates a challenge with which any holistic endeavor, however conceived, would invariably contend. I call this challenge disciplinary fragmentation. The understanding of disciplinary fragmentation given by the dissertation is informed by the Biglan model of subject matter difference. Appearing in 1973 as a tool to study the organization of the research university, the model formalized a system of subject matter classification that hinges on three pairs of oppositions: 1) applied-pure, 2) hard-soft, 3) life-non-life. The model's creator, psychologist Anthony Biglan, postulated the existence of cognitive styles drawn along these lines. Conceiving disciplinary fragmentation as the theoretical splitting of cognitive styles into these categories, the dissertation asks what would consolidate the styles and how could they pose unforeseen obstacles to the flourishing of more holistic approaches in mainstream medicine. The answer it gives involves medical textbooks, learning objectives, electronic medical records, cultural competence training materials, peer-reviewed journal articles and several other pervasive and mundane forms that govern the three arms of mainstream medicine: patient care, research and medical education. Using a new formalist methodology, the dissertation shows how the form of these pervasive and mundane forms could enact the three pairs of Biglan oppositions postulated to underlie disciplinary fragmentation. In so doing, it renders a grounded explanation of why disciplinary fragmentation makes mainstream medicine inimical to holistic healthcare while providing concrete ways it could begin to cultivate more holistic perspectives.

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CHAPTER 1: INTRODUCTION -THE POSSIBILITY OF HOLISTIC HEALTHCARE

1.1 SEARCHING FOR HOLISTIC HEALTHCARE

This dissertation responds to a longstanding and widespread yearning for holistic healthcare. Though notions of holistic healthcare abound, realizing one that lives up to the intuitive yet unfathomable notion of an entirety that is at once complete and unbroken – a whole – has proven elusive. In face of this elusion and guided by the simple hypothesis that no such healthcare would be possible without many thoughtful comparisons across a vast expanse, I work within a field traditionally divorced from medicine – comparative literature – to seek a notion of health and a kind of healthcare worthy of the word whole. To those ends, health and healthcare must be clearly distinguished. Healthcare refers to the organization of time, people, buildings, paper forms, materials and knowledge to meet the formidable task of creating and maintaining health for the members of a society. Health is the collection of values that society chooses to constitute well-being. Healthcare thus seeks to realize health.

With regard to holistic healthcare that takes whole at its word – that is, healthcare that would consider and somehow integrate everything from cells to the global climate, biosphere and beyond in deference to the holistic value that regards health as an irresolvable function of all those factors – the final message of this dissertation is at once sobering and hopeful. It almost goes without saying that holism in this sense cannot flourish in Western allopathic medicine, now widely recognized as the world's dominant healthcare force and the most powerful arbiter of the values that constitute health. What is more difficult to grasp is why. The answer I put forth is disciplinary fragmentation. After elucidating how disciplinary fragmentation renders mainstream

medicine a space inimical to holism, the dissertation speculates on the possibility of disciplinary reconciliation that might make holistic thinking not only possible but safe.

The safety to which this reconciliation aspires evokes Richard Rorty's use of the word in his characterization of the writings of Descartes, Hobbes and other foundational figures of early modern European thought. These writers were not trying to write philosophy in the modern sense of the word but were rather, Rorty writes, "fighting (albeit discreetly) to make the intellectual world safe for Copernicus and Galileo" (131). Rorty's paradox of fighting to ensure safety corresponds with the necessity of engaging in unpleasant upheavals to secure the exchange of ideas that would, in the world preceding those upheavals, face threats inhospitable to their development. To the extent that this dissertation does similarly paradoxical philosophical work, it does so to contribute to securing the intellectual exchanges that would be necessary to bring holistic medicine to fruition.

Appreciating the nature of an intellectual world in which such exchange could occur, albeit without the threats it faces in the current one, begs for a more precise way of defining holistic healthcare. One definition employs, perhaps surprisingly, what is perhaps the fundamental idea of traditional Western biomedicine: the therapeutic target. The term refers to any biological molecule, tissue or process that responds to a medical intervention, whether pharmacological, surgical or otherwise. For the purposes of this dissertation, holistic medicine takes this understanding of therapeutic target and simply extends it. In other words, holistic medicine partakes of many therapeutic targets beyond biology. If engaging with non-biological therapeutic targets goes squarely against contingent and hence mutable legacies of the intellectual world that created biomedicine, then overcoming them might dissolve obstacles that hinder holistic healthcare.

The reflective observations of one of biomedicine's founding figures, Louis Pasteur, helps to define disciplinary fragmentation while situating it as one such legacy. Writing in the March 1871 volume of the *Revue Scientifique,* Pasteur looks outside the laboratory to pose several overtly political questions. In a provocatively titled essay, "Why France Did Not Find Superior Men at Moments of Crisis," Pasteur discusses the explanation for the eponymous statement on which he believes he is most qualified to speak: a half-century's worth of *dis*interest in great ideas, particularly those in the sciences.[1] For him, this disinterest manifests as a single term: "applied sciences" [*les sciences appliquées*] (Pasteur 214). Branding it a "completely incorrect phrase" [*une expression fort impropre*] (214), Pasteur emphatically asserts that "no, a thousand times no, there exists no scientific category that can be called applied science" (215).[2] Those that insist on recognizing this category have, Pasteur believes, no interest in great ideas. Sensing the capacity of language to shape discipline, Pasteur questions the use of this "incorrect phrase" on the grounds that its continued and earnest use sows dangerous practices.

The phrase's insidious danger derives from the damaging rupture that it posits in what Pasteur sees as a highly interconnected process. "There is science," Pasteur writes, "and there are applications of science, as *bound* to one another as the fruit is to the tree that produced it"[3] (215, emphasis mine). To think of scientific problems solely from the vantage of application is to sever, per the logic of the organic metaphor Pasteur employs, the vital connection between the useful application of an idea – the fruit – and the careful labor, creativity, patience and perseverance that nourished the idea – the tree, the earth, the gardening, etc. The nourishing elements place ideas on a "superior order" [*ordre suprérieur*], rendering their application "facile," which is to say, of a

[1] Pourquoi la France n'a pas Trouvé d'Hommes Supérieurs au Moment du Péril
[2] Non, mille fois non, il n'existe pas une catégorie de sciences auxquelles on puisse donner le nom de sciences appliquées
[3] Il y a science et les applications de la science, liées entre elles comme le fruit à l'arbre qui l'a porté.

comparatively lower order (215). It is on the basis of this difference in order that Georges Cuvier, the great French zoologist quoted extensively by Pasteur in the essay, locates a certain vulgarity in doctrines of practicality. If, as Cuvier believes, the discovery of truths presupposes, nay, requires a turn away from "practical cares" [*soins nécessaires*], then a doctrine that makes practical necessities its primary concern amounts to a superficial, self-defeating undertaking (215). This is what Pasteur believes the applied sciences to be: an undertaking that pursues what is ultimately lower order practical thinking and that therefore moves farther from the new and exciting applications it ardently desires.

Where *sciences appliquées* relies on a categorical difference between it and its compulsory other, *sciences théoriques*, Pasteur's preferred expression – science and applications of science – expresses the identical distinction recursively. For the purposes of this dissertation, recursion refers to the philosophical domain of difference-in-sameness, which is to say, a domain that imagines difference or change occurring *without* loss of similitude or continuity. Pasteur's preferred expression is recursively defined in relation to science because the prepositional phrase "of science" embeds science, which is to say, the hard work, the perseverance, the love of knowledge for its own sake, in the application. Nesting does not partake of gaps or divisions as a twin set of qualifying adjectives – e.g. *appliquée* and *théorique* – does. The recursive formulation inherent in Pasteur's preferred expression instead *maintains* a sense of organic, differentiated seamlessness, on the order of that between tree and apple, which the term applied science severs by virtue of oppositional difference with its compulsory opposite, theoretical science. Though Pasteur himself may not have recognized the recursive nature of his preferred thinking with regard to these disciplinary questions, recursion nevertheless represents a possible approach to reconciling the

fragmentation produced by the endurance of applied and theoretical sciences as terms that influence the operation of scholarly activity.

To the likely dismay of Pasteur and Cuvier alike, applied and theoretical science have not lost their influence. Quite the opposite, this set of oppositions was one of three that achieved the prominence of formal codification with the 1973 emergence of the Biglan model of subject matter difference. Developed by psychologist Anthony Biglan, the model that bears his name met a crucial need for assessing the organization of academic activity in higher education. One question framed under this topic asked about the relation between departmental structure and the subject matter that it adopts. With no adequate understanding of subject matter difference at the time, research on this and other questions pertaining to the university could not proceed. As the fruit of two large sets of survey data analyzed using multidimensional scaling techniques, the model at which Biglan arrived classified subject matter difference along three general characteristics: 1) use 2) systematicity and 3) sentience of the object of study. Biglan determined that the combination of these three characteristics best fit data obtained from surveys distributed to a representative sample of 168 faculty members from 36 academic departments of a large, public, research-intensive university, the University of Illinois at Urbana-Champaign and 54 members of a small, unnamed liberal arts college. The choice of the two vastly different institutions – one exhibiting high and one exhibiting low disciplinary diversity – made for stronger evidence that whatever characteristics emerged from the two data sets would serve as the best predictors or disciplinary difference writ large. The faculty members from each institution served as judges of subject matter difference, rendering their judgments through a sorting task that involved grouping academic areas or departments together based on perceived similarity. The same three characteristics best described both sets of the survey data, leading Biglan to conclude that they represented the most

pertinent characteristics marking subject matter difference. Accordingly, they became the basis for his model of subject matter difference, each characteristic corresponding, in accordance with multidimensional scaling techniques, to a scaled dimension with two poles in a Cartesian coordinate system. The two poles of the third dimension – object of study – were assigned the names 'life system' and 'nonlife system'; the two poles of the second dimension – systematicity – were assigned the names 'hard' and 'soft'; finally, the two poles of the first characteristic – use – were assigned the names 'pure' and 'applied.'

Once formed, the Biglan Model became a means of grouping any number of academic departments into a manageable set of eight clusters. Figure 1 below shows one such eight-part clustering from a validation study that Biglan published alongside the article that introduced his model:

Figure 1: Academic departments sorted across the three characteristics of subject matter differences identified by the Biglan Model

TABLE 2

CLUSTERING OF ACADEMIC TASK AREAS IN THREE DIMENSIONS

Task area	Hard		Soft	
	Nonlife system	Life system	Nonlife system	Life system
Pure	Astronomy Chemistry Geology Math Physics	Botany Entomology Microbiology Physiology Zoology	English German History Philosophy Russian Communications	Anthropology Political science Psychology Sociology
Applied	Ceramic engineering Civil engineering Computer science Mechanical engineering	Agronomy Dairy science Horticulture Agricultural economics	Accounting Finance Economics	Educational administration and supervision Secondary and continuing education Special education Vocational and technical education

While the list of academic departments clustered in Figure 1 is far from exhaustive and may not lend itself to classifying the disciplines created since the model's appearance in the early 1970's,

it nevertheless shows how the Biglan model functions and how it could still be used to understand university activity. One of the research directions that Biglan singles out involves understanding the cognitive processes of different fields. Not only does Biglan claim that the model "provides a systemic framework for exploring the role of cognitive processes in academic fields," but also that its three dimensions represent "the three most important dimensions for characterizing the 'cognitive style' of an area" (Biglan, "The Characteristics" 202).

The notion of distinct cognitive styles constitutes the sort of disciplinary fragmentation that this dissertation proposes as an inimical force to holistic healthcare. As distinct cognitive styles become categorically different cognitive styles, the possibility of holistic healthcare – an endeavor that, by dint of its ambition to partake of infinite therapeutic targets, would cultivate a limitless plurality of cognitive styles – becomes increasingly remote. Understanding the three characteristics alleged to define the categorically different cognitive styles of disciplinarity thus could present a crucial first step in creating an intellectual world capable of supporting a holistic approach to healthcare. To that end, brief discussions given in the next three sub-

s describe the salient traits of each subject matter characteristic with respect to Biglan's analysis before opening up further questions about the splitting of the characteristic at hand into discrete categories.

1.1.1 First Biglan Dimension: Use – Applied vs. Pure

The discussion section of the article that introduced the Biglan model primarily serves an exemplary function of the first subject matter characteristic: it offers education, engineering, and agricultural areas as examples of applied areas that stand in contrast to such pure fields as the humanities and social sciences. Biglan's accompanying validation study, which attempts

predictions of departmental activities and dynamics according to where the given area falls across the three dimensions (use, systematicity, and object of study), gives comparatively more insight into what the applied-pure distinction means, stating that one characteristic of applied areas is the preponderance of technical reports. "Presumably," Biglan writes, "technical reports provide an ideal format for communicating detailed research results to the groups and individuals who are serviced by applied areas" (211). Biglan's assessment of technical reports portrays applied fields as the mediators between theoretical or pure research and those that use or are serviced by it. Left unexplained is the nature of that mediation: there is little comment on whether the communication accomplished by technical reports serves a translational function whereby it clarifies practical use of pure research, or whether it performs a more perfunctory transmitting function.

As a result of these and other unanswered questions, there is little indication of whether the applied-pure dimension reproduces the dangers Pasteur saw in the use of *sciences appliquées*. The intricacies of application are easy to underestimate, justifying a qualification to the general opinion held by Pasteur and Cuvier that it constitutes a lower order task. It would of course be a mistake to assume that creativity, perseverance, effort and love of knowledge, the very nurturing elements that made ideas of higher order in the estimation of the two scientists, do not appear in the task of moving an idea from, say, the laboratory to the farm. Nevertheless, the two 1973 articles by Biglan do little to articulate the nature of the intellectual exchange that occurs in technical reports, to say nothing of other aspects of the relationship between applied and pure areas. So while it might be hasty to locate in the applied-pure dimension the rupturing effects for which Pasteur accuses the distinction between *sciences appliquées* and *théoriques,* the Biglan model does in no way foreclose the possibility of regarding the applied and the pure as categorically distinct ways of thinking, the very categorical distinction that Pasteur feared.

1.1.2 Second Biglan Dimension: Systematicity – Hard vs. Soft

Framed by Biglan as empirical evidence of Thomas Kuhn's seminal 1962 analysis of the role paradigms play in the development of scientific thought, the second major characteristic of subject matter difference – systematicity – vindicates the degree of consensus around a single, cohesive body of theory – a paradigm – as a strong predictor of subject matter difference. "The paradigm," Biglan writes, "serves an important organizing function; it provides a consistent account of most of the phenomena of interest in the area and, at the same time, serves to define those problems which require further research. Thus, fields that have a single paradigm will be characterized by greater consensus about content and method than will fields lacking a paradigm" (Biglan, "The Characteristics," 202). Further corroborating Kuhn's results, biology and physics – two fields designated by Kuhn as paradigmatic – emerge in Biglan's analysis as academic areas with a high degree of consensus around a discrete set of principles, the Theory of Evolution, the Central Dogma of Molecular Biology and the Laws of Thermodynamics being just a few. By virtue of the broad consensus around these and other theories, biology and physics are deemed hard areas. In contrast, the humanities and education emerge as areas for which "content and method […] tend to be idiosyncratic," earning them the soft designation (202). The multiplicity of theoretical frameworks in literary studies alone, which includes but is not limited to Marxism, Feminism, Psychoanalysis, Historicism, Structuralism and Post-Structuralism, Deconstruction, Queer Studies and Aestheticism, testifies to the possibility for greater freedom and, by that token, greater debate over content and method in humanistic areas.

It is perhaps this sense of greater plurality, and not the paradigm concept itself, that constitutes the basis of the popular and often pejorative usages of the hard-soft distinction. The relative degree of theoretical pluralism can account for the popular understanding of hard as

incontrovertibly true and the soft as, while not untrue per se, far more open to manipulation and therefore suspect. It is understandable why a layperson might assume that a field where many theories vie for dominance is more vulnerable to academic charlatanism than one with only a few, highly established theories. While the Biglan model cannot assume full responsibility for such assumptions, the hard-soft dimension perhaps has a role in stoking a categorical difference that belies the burden on *all* academic areas to develop consensus for *any* new theory that it seeks to promote, regardless of whether that theory is "idiosyncratic" or in deference to a theory to which many researchers already subscribe.

1.1.3 Third Biglan Dimension: Sentience of Object of study – Life system vs. non-life system

The last characteristic of subject matter difference identified by Biglan involves the vitality of research objects. Insofar as it tacitly issues a ruling on what constitutes life and what does not, the corresponding life-nonlife dimension stands as the most dangerous of the three. The two initial Biglan studies offer virtually no insight into the criteria by which animate is distinguished from inanimate, almost as if to suggest that the distinction were self-evident. A survey of the areas that fall on the life end of the dimension reveals that all of the conventional candidates for living organisms – humans, animals, plants and microorganisms (e.g. bacteria, protozoa, fungi) along with their cells, tissues and physiological processes – all figure as animate objects of study. However, upon closer examination, grafting these conventional understandings of life on to a system of articulating academic subject matter leads to innumerable inconsistencies.

It would be laughable, for example, to question whether microbiology, a subfield of what is, etymologically speaking, the study of life, belongs on the life axis of the dimension. Yet the assumption that it does glosses over longstanding debate on whether one of microbiology's

undisputed objects of study, the virus, actually constitutes a living entity. The argument could be made that there is no inconsistency in consideration of how viruses must, by definition, interact with indisputably living things, thereby rendering the area that studies them a life area, even if viruses are themselves not living in their own right. The opposite case, whereby a living object of study falls on the nonlife pole, perhaps presents far graver intellectual and ethical problems in a situation where life is privileged over non-life. One area that might have particularly suffered this from error is communication studies, as Figure 2 below makes clear. Taken from Biglan's validation study, the graph below shows a number of academic areas across two dimensions: applied-pure and life-nonlife.

Figure 2: A coordinate system from the 1973 Article that introduced the Biglan Model showing communication in the nonlife, soft quadrant and microbiology in the life, hard quadrant

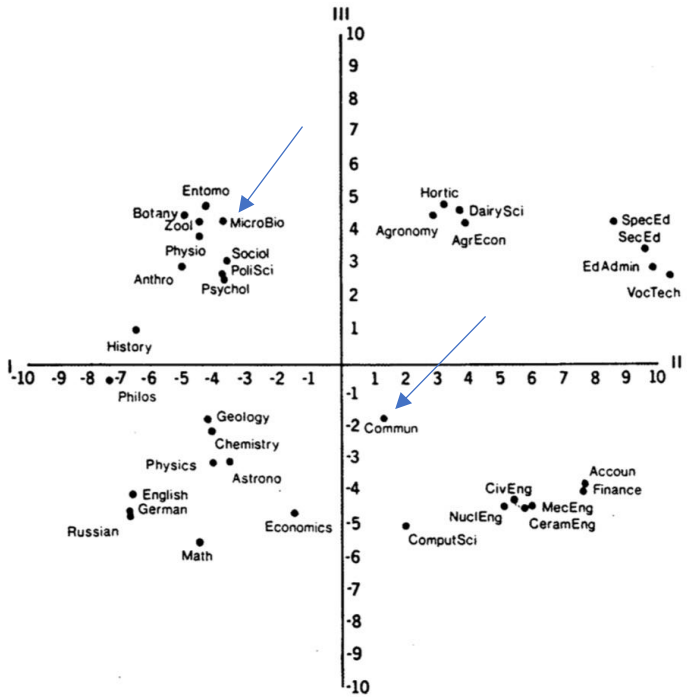


FIG. 2. Dimension II appears horizontally, and Dimension III appears vertically.

Though close proximity to the graph's origin – the point (0,0) – indicates its position on the cusp of both dimensions, communication studies ultimately falls within the nonlife, applied quadrant. While communication studies may not study humans directly, calling its object of study a non-life matter reads as wholly arbitrary, particularly in light of the previous example involving viruses. Separating advertising and other media artifacts from the living humans that create and respond to them for the sake of justifying non-life status for communications studies is indefensible if a non-living entity like a virus gets to remain in a life area by virtue of its necessary interactions with living organisms. These and numerous other inconsistencies speak to the often arbitrary and possibly insidious divisions created by the life-nonlife dimension.

1.1.4 Categorical Disciplinarity, Disciplinary Fragmentation and the Biglan Model

The Biglan model's three dimensions no doubt raise numerous questions about the nature of the modern university as well as the proper tools by which to understand that nature. Subsequent investigation has reported numerous departmental variables successfully predicted by the Biglan model, including degree of social connectedness, departmental goals, and duties performed by the departmental chair, among many others.[4] Together with Biglan's suggestion that the three subject matter characteristics mark distinct cognitive styles, these successfully predicted variables justify the model as a useful tool for pursuing questions about disciplinarity, just as it was intended to do. Yet the problems outlined in the previous sections, particularly the problems highlighted by viruses and communication studies, show that the model is far from infallible.

[4] See Creswell and Roskens, Creswell and Bean, Smart and Elton.

In view of these considerations, the Biglan model is, for the purposes of this dissertation, taken as an idealized set of categorically different cognitive styles, albeit with the provision that the nature of what those categories mean is never completely fixed and can fluctuate. As a set of cognitive styles, the Biglan model stands as one way of doing categorical disciplinarity, which is to say, disciplinarity that relies on the categorization of cognitive styles and, in so doing, puts disciplinary fragmentation into operation. In the effort to build a theory of what disciplinary fragmentation might be, how it would contribute to an intellectual world inimical to holistic healthcare and, finally, how disciplinary reconciliation might be achieved, the dissertation considers the Biglan three dimensions in relation to traditional, Western biomedicine. Understanding this relation in turn requires a working familiarity with the formation of mainstream medical institutions in the United States at the beginning of the twentieth century.

1.2 THE FLEXNERIAN ENTERPRISE: AN ALLIANCE OF PATIENT CARE, RESEARCH AND MEDICAL EDUCATION

Considering Pasteur published his thoughts on *sciences appliquées* and *sciences théoriques* as early as 1871, the cognitive styles proposed to constitute disciplinary fragmentation undoubtedly collided with the post-bellum germination of the modern American medical system. The importing of medical knowledge from France, among other European nations, created ample opportunity for such collisions to occur. It was not until after the turn of the century, though, that the so-called Flexnerian Revolution established the first recognizably modern form of mainstream medicine: an institutional union of medical education, advanced scientific research and patient care. For the purposes of discussion in all forthcoming chapters, the term “Flexnerian enterprise” refers to this

basic tripartite institutional configuration and will supplant the phrase "mainstream, allopathic medicine," which certainly contains but does not specify this tripartite configuration.

The Flexnerian Revolution began with the 1910 report of the figure whose name they bear, Abraham Flexner. Funded by a grant from the Carnegie Foundation for the Advancement of Teaching, the so-called Flexner report called for the closure of for-profit, proprietary medical schools that were prevalent in post-bellum America and offered poor, unregulated, disorganized medical training. The report also galvanized the still nascent medical education reform efforts that had already begun before the turn of the century in isolated pockets of the country. Though the 1893 opening of Johns Hopkins Medical School, for example, added to the small list of pioneering medical institutions for less developed schools to emulate, the confinement of medical education reform to the medical profession itself meant that the available resources diverted to such efforts fell far short of that necessary for large-scale reform. However, the Flexner report made medical education reform a *cause célèbre*, catapulting a confined, profession-limited undertaking into a sweeping national campaign. One of the primary reasons for the report's success in raising public interest was its emphasis on the profound gap between the state of scientific knowledge and the practice of medicine. One particularly evocative illustration of this gap is the case of a Harvard Medical School graduate who, upon establishing his own practice in Nebraska, was "stunned" to learn that his microscope was possibly the only one in the region (Ludmerer 5). Considering this occurred in 1912, thirty years after the birth of bacteriology and the work of Pasteur, Koch and others solidified the germ theory, the instance of American physicians being well versed in the cutting-edge medical science of the day veered more toward the exception than to the rule.

To make mastery of cutting-edge scientific knowledge among practicing physicians the rule rather than the exception, the Flexner report built on – rather than began – the effort to forge

stronger institutional ties between medical schools and large research universities. Decades before the Flexner report of 1910, the institution of the medical school figured in strategies adopted by university presidents to consolidate the position and role of the university institution: the "control of medical school," so the logic went, "would help validate the university's claim to hegemony in all matters of education and professional training" (Ludmerer 14). Having claimed and actively working toward preeminent leadership in the tasks of knowledge production and transmission, the post-bellum American university boasted the infrastructure, resources and programs that could support the research activities underwriting the progress of medical science. Immersing medical students in the most current scientific research thus served the greater efforts of streamlining the application of scientific advances generated by research universities to medical problems, thereby guaranteeing the high quality of physician training as well.

The development of affiliations between medical schools and American universities occurring in the late nineteenth century coincided with the latter's reformation in the image of the German model. Extolling the virtues of the model that made it so appealing, Flexner himself declared that of America, England and Germany, "Germany has in theory and practice come nearest to giving higher education its due position" (Flexner 305). Less clear is what precisely accounts for the model's success at home and subsequent appeal abroad. Many answers cite *Lehrfreiheit* and *Lernfreiheit*, or the teacher's freedom to lecture and research and the student's freedom to follow a self-chosen course of study, respectively. These commonly mentioned ideals aside, another, less apparent explanation may lie in a productive, if under-appreciated, tension whereby the first modern academic division of labor developed alongside sustained conversation over the unity of all knowledge that extended at least as far back as the eighteenth century.

At least three foundational texts on the subject of the German university all celebrate and emphasize this unity. Friedrich Schiller, in his 1789 inaugural lecture as professor of history at the University of Jena, gestures to the subject by way of a comparison between the "philosophical mind" [*philosophisch Kopf*] and the "careerist scholar" [*Brotgelehrte*] (424). Whereas the "scholarship" [*Wissenschaft*] of the latter becomes increasingly "isolated" [*absondert*], that of the former works to "reestablish" [*herzustellen*] its "connectivity with the rest" [*Bund mit den übrigen*] (424). Schiller elucidates the full meaning of "reestablish" by noting that it was "abstractions of the intellect" [*abstrahierende Verstand*] that created the "boundaries" [*Grenzen*] in the first place (424). It would seem, if Schiller's observations are any indication, that reestablishing connections in the pursuit of unity is coupled to understanding the workings of the mind.

Friedrich Schleiermacher extends the question of scholarly unity to politics, arguing in an 1808 essay that the "systematic" [*wissenschaftlich*] production of knowledge calls its practitioners to the high task of "dissolving" [*aufzuheben*] "the separation between different spheres" [*die Trennung zwischen verschiedenen Gebieten*] (23). To do so would thus presuppose a unity of all knowledge that extends far beyond and thus defies national and linguistic boundaries. For this reason, "the community" [*die Gemeinschaft*] in which Schleiermacher believes the State "must stand" [*stehen müssen*] "exists in scholarly activities as it does nowhere else" [*nirgends aussprechen als in wissenschaftlichen Dinge*] (25). However, barring a political adoption of the collaborative seen in scholarly activities, the state, Schleiermacher says, will put its interests first. The consequence of this "selfish" [*selbstsüchtig*] attitude for knowledge production is that scholarly advancements have no other value than to advance the state (24). Pasteur corroborates this reality, citing alongside his criticism of *sciences appliquées* the words of an 1868 letter of thanks to the Empress Eugénie from, presumably, a prominent scientist: "the great task of this

moment is to assure France's superiority in science"[5] (212). For the anonymous writer of these words, the purpose of scientific advancement has little to do with knowledge but instead with political supremacy.

Finally, in what is perhaps a more optimistic assessment of the political relationships binding nationhood and discipline together, Wilhelm von Humboldt, to whom tradition ties the German university concept most closely, identifies three intellectual tendencies that do not belong exclusively to. but which are nevertheless found in, "the German national character" [*Der intellektuelle Nationcharakter der Deutschen*] (253). These tendencies are: 1) "to derive" [*abzuleiten*] everything from "first principle[s]" [*ursprüglichen Princip*] 2) "to develop" [*zuzubilden*] toward an "ideal" [Ideal] 3) "to connect" [*verknüpfen*] the principles and ideal in a "single idea" [*eine Idee*]. Thus, the practices outlined by Humboldt leave little doubt as to the importance of unity of knowledge in the German intellectual tradition.

Alongside rich contemplation about the unified nature of scholarship was the first instance of systematically dividing knowledge production into a regulated, circumscribed endeavor, one given to fragmentation. At the beginning of the nineteenth century, as the dust of the French Revolution settled, a number of previously languishing German universities finally closed, clearing the way for innovation and reform. Among these innovations was the creation of the academic discipline itself: "it was […] in the German universities, more than anywhere else, that the main fields of scientific inquiry developed into 'disciplines' possessing specialized methodologies and systematically determined contents" (Ben-David and Zloczower 48). Indeed, the first half of the century saw the rise of humanistic classical studies from which new branches of philological and historical research sprang. Alongside these rose the mathematical and natural

[5] La plus grande œuvre à accomplir en ce moment est d'assurer la supériorité scientifique de la France.

sciences, the latter going on to supplant philosophy as the preeminent intellectual pursuit. By the 1860s, the four faculties of the medieval university – theology, law, philosophy and medicine – no longer existed, having been replaced by the fruits of an incessantly multiplying sequence of academic specializations, the differences between whose subject matter the Biglan model would later try to schematize in the late twentieth century.

Regardless of the extent to which Flexner and the early university presidents who together shaped the American university in the late nineteenth and early twentieth centuries appreciated the complex tension between disciplinary specialization and the unity of knowledge in the German university tradition, the latter nevertheless afforded a division of academic labor that served the needs of medical research. Having presided over the proliferation of the modern disciplines, the German model naturally supported the germination of disciplines that medical science needed in order to progress. In the words of Flexner, "medicine stood almost still until the pre-clinical sciences were *differentiated* and set *free*" (14, italics mine). Indeed, the scholarly liberation and subsequent successes arising from academic differentiation made for a mutually favorable marriage of medicine's needs with the disciplinary germination permitted by the modern, German-inspired research university.

The same could not be said for incorporating hospitals into the alliance. This incorporation encountered resistance from hospital administrators who did not welcome the prospect of aligning their primary mission – patient care – with those of medical research and medical education. Hospital trustees, among others, were wary of the inevitable disruptions and tensions resulting from scientists collecting tissues and gathering data or from medical students fumbling through basic tasks as they developed clinical skills. Yet hospitals had what both research and education increasingly required: patients. The aftermath of the Civil War saw the emergence of progressive

education whose emphasis on active learning translated into rigorous clinical experiences for medical students, while the maturation of the clinical sciences required access to actual cases of the diseases clinical scientists sought to better understand. Gradually, consensus that the three basic activities of what would become the Flexnerian enterprise – research, patient care and medical education – could enter into a symbiotic relationship emerged and by the 1920s, a new institution, the teaching hospital, was born. The teaching hospital helped promote the progressive educational value of active learning by supporting a system of clinical clerkships whereby each medical student, under the guidance of senior physicians, could assume responsibility for a limited number of patients in each of the core medical specialties. It also provided unlimited access to disease cases without which the work of clinical research could not proceed. In return, teaching hospitals enjoyed the financial benefits of university affiliation as well as the intellectual and physical vigor brought by medical students and researchers. With the final obstacles cleared by the 1920s, the Flexnerian system was complete, the modern medical enterprise achieved.

But despite the decades of successes reaped by the Flexnerian trinity of medical education, research and patient care, the initial reluctance of hospitals to join the Flexnerian revolution would prove to have had some merit. The object of this reluctance lay hidden in plain sight, residing in the very guiding principle on which the Flexnerian enterprise was based: "harmony among education, research and patient care" (21). Ludmerer considers the faith in this harmony "one of the great ironies of medical education" given that this harmony "was never proven, only assumed" (21). The existence of such unexpected collisions would in turn explain Ludmerer's observation that the equilibrium was "potentially unstable" (21). A testament to how this instability "would haunt both medical schools and teaching hospitals in a later era," the spread of managed care in the 1980s and 1990s helped to disrupt this fragile equilibrium and thereby precipitated further

instability, both financial and logistical (21). The blows the Flexnerian enterprise sustained from the managed care movement and other forces, to say nothing of reforming it for holistic purposes, demand a closer look at the clashes both between and within its three basic activities.

At the risk of oversimplification, the Biglan model gives an immediate impression of these clashes. With respect to cognitive style, medical research would, per the Biglan classifications, most likely have a pure-hard-life cognitive style, patient care an applied-hard-life style and medical education an applied-soft-life style. Though ostensibly aligned by their concern with life, the collision of applied and pure, hard and soft styles nevertheless presents opportunities for destabilizing clashes. These designations, however, only give the vaguest impression of the disciplinary fragmentation that proliferated under the alliance of medical research with the modern research university. The effects of categorical disciplinarity for medicine, as Flexner noted with celebration, were liberating, yet they also created troubling contradictions. One such contradiction arises from the categorical difference that distinguished fundamental research from preclinical research. Often regarded as the "handmaidens" of clinical disciplines like internal medicine or pathology, the preclinical disciplines such as physiology and microbiology distinguished themselves from fundamental disciplines such as biology and chemistry on the basis of "relevan[ce] to students and practitioners of medicine" (Ludmerer 34). Whereas the fundamental disciplines pursued fundamental questions, the former emphatically focused on "disease treatments and mechanisms […] *even as,*" Ludmerer points out, "biological and chemical techniques were increasingly used in their work" (34, italics mine). Distinguishing the missions of the preclinical sciences from those of the fundamental subjects thus belied a disciplinary cross-breeding that resoundingly contradicted any claims to categorical difference both promoted by those same mission statements and possibly articulated by the Biglan model.

Driven by the complex and inevitable collaborations between preclinical researchers and practicing clinicians, further categorical differences proliferated in preclinical research itself. Ludmerer characterizes the orientation of the preclinical sciences toward medicine as primarily reflecting "the fact that the smallest unit of study was the cell" (35). If the cell was the most basic biological unit and thus the territory of so-called basic biology, then a majority of the preclinical sciences divided tissues, organs or whole organisms among themselves, thereby marking their boundaries according to increasingly complex levels of biological organization. These levels made for "firm and inviolable" borders between subject areas: "biochemistry was biochemistry; physiology was physiology; pathology, pathology; and microbiology, microbiology – each subject taught by a separate department and defined as sharply and discretely by its intellectual content as college undergraduate subjects like mathematics, history and classics" (Ludmerer 35). Approaching these subject matter differences as not merely a function of content but of cognitive style brings the influence of disciplinary fragmentation into the realm of the Flexnerian enterprise. The reification of these differences over the late the twentieth and early twenty-first centuries would have cultivated a fragmentation of cognitive styles that would in turn render holistic medicine inconceivable.

1.3 COMPARATIVE LITERATURE AND THE DOUBLE BINDS OF DISCIPLINARITY

Before developing a more sophisticated understanding of how disciplinary fragmentation renders the Flexnerian enterprise an intellectual environment hindersome to holistic healthcare and making suggestions for an environment that would support it, some initially confounding problems with even doing so must first be addressed. First, positing disciplinarity itself as a sort of impediment

to holistic healthcare before endeavoring to get around that impediment altogether entails overcoming two seemingly intractable double binds. The first double bind has to be dealt with before work on the subject can even begin and is best expressed as a question: what basic activities of discipline – reviewing extant literature, theorizing, writing, organizing, measuring, etc. – could be trusted to understand disciplinary fragmentation? Put another way, what discipline or what single disciplinary framework can articulate a problem of disciplinarity? These questions effectively broach the disciplinary equivalent of the paradox with which philosophers of the mind grapple: can the mind understand itself? The genesis of the Biglan model, an effort made from inside the research university to create a framework to understand the research university, makes the dizzying self-referentiality of this problem more apparent. Biglan was a psychologist and the journal in which he published his model was the *Journal of Applied Psychology*. Psychology, whether conceived as a set of questions, practices, literature, group of researchers, is of course at least in part constituted by and thus existing within the modern regime of knowledge production, begging the question of what gives it, rather than other disciplines, the special capacity to step back and classify subject matter on behalf of the entire disciplinary regime.

Of course, no discipline could step back more than an altogether alternative disciplinarity. Francesca Bordogna's *William James at the Boundaries: Science, Philosophy and the Geography of Knowledge* makes multiple disciplinarities thinkable by "recasting the emergence of the modern regime of standardized knowledge production, one premised upon the quest for universal objectivity, the requirement of impersonality, and bureaucratic interactions among knowledge producers" (Bordogna 272). A historiographical account tracing the field-spanning professional career of William James and his resistance to the disciplinary boundary consolidation that his career coincided with, the book recasts the regime's inevitability by showing that "the processes

resulting in the entrenchment of the new moral, social and epistemic rules governing scientific knowledge were heavily contested and their outcomes could have been vastly different" (Bordogna 273). In light of these revelations about James' career and his grave concerns with the foundations of what would become the research arm of the Flexnerian enterprise, it becomes possible to imagine an alternative disciplinarity with a different set of values. The idea of two disciplinarities in turn releases the first double bind: the alternative disciplinarity articulates the fragmentation of the one that creates an intellectual world inimical to holistic healthcare.

Fortunately, what loosens the first double bind – alternative disciplinary – also loosens the second. The second double bind arises from how holistic healthcare, partaking of infinite therapeutic targets, would call for limitlessly integrating knowledge from theoretically unrelated traditions without losing the theoretical constraints that check intellectual anarchy. This is a calling that cannot proceed under the categorical disciplinarity of the Flexnerian enterprise, which hinges on disciplinary centers. The function of any disciplinary center is to impose limits by, among other things, a vocabulary, a set of techniques and procedures that dictates how the previous two are used. No matter how cleverly constructed the disciplinary center, its constraining capabilities would eventually buckle under the extensions demanded by truly holistic measures. For it is impossible to conceive of a *stationary* disciplinary center that could admit the *mobile* extension of the relentless and limitless integration that the intuition of holism would require. Hence, the need for exclusion, the imperative to keep things out of the center for the sake of maintaining constraint. Yet exclusionary measures, by definition, do not promote completeness and thus cannot be considered holistic. Such is the intractable double bind that disciplinarity imposes on holistic aspirations. An alternative disciplinarity could get around this double bind in two ways: eschewing

disciplinary centers altogether or installing change as a disciplinary center. The alternative disciplinarity proposed by this dissertation seeks the latter course.

Having postulated a change-centered alternative disciplinarity as the solution to these two intractable double binds, the question arises of where best to search for the solution and how cultivate it. The most tempting answer would be outside conventional disciplinarity, which is to say, independent of any major, mainstream academic institution. However, the major disadvantage of this option is that the regime of categorical disciplinary could always deny the onus of taking seriously any of the criticisms that it does not produce itself. The resources and cultural authority enjoyed by categorical disciplinarity suggest that it would need to buy in to any alternatives to itself. Therefore, these criticisms must come from within the regime of categorical disciplinarity while still being enough outside it to observe and cultivate alternative values. The discipline that perhaps best strikes this balance is Comparative Literature. Of all reputable academic disciplines, Comparative Literature has long had the most complicated relationship with the constraining limitations inherent in categorical disciplinarity. For factions that would overlook the field's position among university academic departments and contest its very reputability, Comparative Literature is an anti-discipline of sorts where any disciplinary procedure is permissible. One of the field's leading figures, Haun Saussy, suggests that the field's "transnational" approach to literature and culture – its signature and yet most risky disciplinary procedure – helped sow, more than anything else, the field's reputation for dilettantism (3). And yet this same approach of working across national literary boundaries has been also, Saussy argues, at least partially responsible for the very concept of interdisciplinarity, perhaps the most rehearsed academic talking point, a point he sums up by saying that "our conclusions have become other people's assumptions" (3). Though the debate over the disciplinary validity of Comparative Literature's transnational approaches

continues, the debate over the role that approach has in establishing Comparative Literature's connection to world literature is well established. It is the fruitful alliance between Comparative Literature's concern with comparison and world literature's aspirations for a holistic perspective that creates an intellectual space in which to cultivate the change-centered disciplinarity that could permit holistic healthcare.

Understanding the close relationship between Comparative Literature and world literature helps explain why the former enjoys this distinction. Many commentators acknowledge Comparative Literature's debt to Johann Wolfgang von Goethe's conception of a *Weltliteratur*, or, world literature. Though Goethe himself did not write widely on *Weltliteratur*, he nevertheless helped establish what would become Comparative Literature's two traditional axes of comparison: language and nation. That is, Goethe proposed the idea of a discipline that compared literary texts on the basis of the language in which they were composed and the national identity of the author. He also anticipated a crucial tension – that between nation and world – which he evoked most concisely in his famous dictum: "national literature is now rather an unmeaning term; the epoch of world literature is at hand" (23). Subsequent scholarship on the meaning of Goethian *Weltliteratur*, composed against the backdrop of globalizing forces that render nation an increasingly "unmeaning term," frames the debates that have arisen over the discipline's traditional axes of comparison as well as what the study of world literature would even entail. One point in the debate made by Robert J. Clements in *Comparative Literature as Academic Discipline* (1978) takes issue with the definition of world literature given in the American Comparative Literature Association's (ACLA) first report on the state of the discipline, published in 1965. Clements characterizes the 1965 ACLA report's definition as a "sanction to a misnomer invented largely by textbook publishers" and offers an alternate definition of world literature as "the maximum

geographic dimension of comparative literature" (Pizer 23). With this definition comes the challenge of "developing a discipline fully cognizant of the still developing age of cultural globalization" in the twenty-first century (223). One of the primary ways of doing so seems to be finding alternate axes of comparison in view of the increasingly accepted reality that in a globalized world, language and nation no longer explain, and in fact may obscure, the crucial differences and similarities comparativists seek to articulate. Discovering alternate methods of comparing the whole globalized world, while ever avoiding the pitfall of forcing them to conform to a totalizing schema, is the mission that seems to motivate the alliance between Comparative Literature and world literature.

In what amounts to a disciplinary variation of that same mission, Fedwa Malti-Douglas calls for the use of comparative methods "beyond what we normally defined as literature into a wider variety of texts, understood in the largest possible context, and encompassing the rich areas of law, medicine and science" (175). Malti-Douglas' proposal extends the purview of Comparative Literature and thereby infinitely broadens the meaning of the word literature itself such that it refers not only to literary texts but to the texts of virtually any field or discipline (why stop at "law, medicine and science"?). In Malti-Douglas' proposal, the maximum geographic dimension of comparative literature – the world – would mean all disciplines. The disciplinary ambition inherent in this proposal in turn does justice to three realities: 1) the reality that disciplines function as (contingent) segmentations of the world; 2) the reality that a great many, if not all, disciplines already refer to the textual corpora with which they engage as "the literature"; 3) the reality of incessant calls for interdisciplinarity that render discipline, like the nation in Goethe's estimation, an increasingly "unmeaning term" and thereby stoke the rumblings of a post-discipline university.

These three advantages help to set up Comparative Literature as an alternative disciplinarity to the categorical disciplinarity of the Flexnerian enterprise.

The redefinition of three terms – comparative, world, and literature – to reflect a pan-disciplinary ambition helps give further shape to an alternative disciplinarity capable of supporting the development of holistic healthcare:

- The first term – the adjectival transformation of the verb "to compare" – refers to centrality of comparison. Comparing is a practice, among many, upon which every discipline, in one way or another, relies. The practice of holistic healthcare would not only stress reflection on practices in general but also rely on bold, inventive comparisons to make decisions and create new ideas.
- The second term – "world" – would signal the holistic implications of studying disciplinarity as such. To the extent that disciplinarity establishes a division of academic labor that presupposes the world's segmentation into manageable, researchable domains, the term 'world' is a reminder of that easily forgotten segmentation as well as the holistic value that health is ultimately a function of the world.
- The final term – "literature" – refers to the body of texts according to which a discipline orients itself and measures its progress. The citing of literature ensures that orientation and rigor still exists, even if it changes as part of the reflection on practices, in the alternative disciplinarity of holistic healthcare.

A disciplinarity defined by the meanings of these three terms thus gives an impression of an alternative disciplinarity that would not only enjoy the privilege of articulating the disciplinary fragmentation of the Flexnerian enterprise's research arm but also of possibly cultivating the change-centered disciplinarity capable of supporting holistic healthcare.

1.4 LOOKING AHEAD

Having situated the problem of holistic healthcare vis-à-vis disciplinary fragmentation, the tri-partite institutional configuration of modern medicine and the alliance between Comparative Literature and world literature, chapter one is finished. Looking ahead, chapter two offers an overview of holistic medicine as it manifested, at overlapping moments, in each of the three arms of the Flexnerian enterprise. The chapter considers two holistic attempts at patient care – biopsychosocial model and Integrative medicine – along with their respective holistic research operations – General Systems Theory and Integral Physiology. As neither of these mounted a recognizable vision of how their respective ideas could be taught at the post-baccalaureate level, narrative and schema-based medicine – two projects falling under the medical or health humanities rubrics – stand as two attempts at holistic medical pedagogy. Each overview balances an elucidation of the characteristics that qualify the projects as holistic with a sympathetic critique of why they failed to achieve or, if they are still active, have yet to and will almost certainly never achieve the holistic ideals envisioned by their respective proponents. The explanation given for this sobering assessment hinges on a reluctance to mount an adequate intervention in disciplinary politics, leaving intact the categorical disciplinarity that is inimical to holistic healthcare. The chapter concludes with an impression of the sort of disciplinary interventions that the critiques of the failed holistic projects call for.

The third chapter assembles methodological tools to make these interventions by a disciplinarity not beholden to a fixed set of tools with verifiable affiliations between one another but instead simply collects what is needed to accomplish the goals it has set for itself. As the resulting set of tools for this dissertation shows, however, this manner of collecting is not random,

arbitrary and incoherent. Besides pragmatically responding to some of the challenges of holism elucidated in chapter two, the tools all share one characteristic: a radical re-thinking of formalism. With one exception, no theorist would identify as formalists. Nevertheless, their tools converge on productive ideas about form, defined in its broadest possible sense as an arrangement of elements. Altogether, these tools help create a formalism called recursive formalism.

Chapter four subsequently tackles a task proper to recursive formalism: understanding disciplinary fragmentation as it modulates and fluctuates in the Flexnerian enterprise. Informed by the methodologies expounded in chapter three, chapter four examines three forms, one from each domain of the Flexnerian enterprise, to elucidate their role in consolidating disciplinary fragmentation along Biglan lines. For example, the chapter discusses written exams, a form that unquestionably influences medical pedagogy, in relation to the applied-pure dimension. Board exams join the electronic medical record (EMR) and the peer-reviewed journal article, two forms belonging to patient care and research, respectively. Following the same basic procedure for the three Biglan dimensions amounts to an analysis of nine forms that collide with one another across the three domains of the Flexnerian enterprise. Table 1 summarizes the nine forms according to the Flexner domain to which they traditionally pertain and the Biglan dimension to which they are being related.

Table 1: Summary of the Flexnerian forms examined in chapter 4 and how they are discussed in relation to the Biglan Model's oppositions

Arm of Flexnerian Enterprise	Biglan Opposition		
	Applied vs. Pure	Hard vs. Soft	Life vs. Non-life
Education	Written exams and mnemonics	Learning Objectives	Objective Structured Clinical Examinations (OSCE)
Research	Peer-reviewed journals and journal articles	Medical Textbooks	Institutional Review Board (IRB) Guidelines
Patient Care	Electronic Medical Records (EMR)	Evidence hierarchies	Cultural Competence Trainings

Finally, chapter five speculates on how disciplinary reconciliation might be achieved, using the ideas developed in Chapters Three and Four to cast this reconciliation as formalist in nature.

CHAPTER 2: HOLISTIC HEALTHCARE UNDER CATEGORICAL DISCIPLINARITY

2.1 POLITICAL WEAKNESSES OF PAST ATTEMPTS AT HOLISTIC RESEARCH, PATIENT CARE AND MEDICAL EDUCATION

Past and current attempts at holistic patient care, research and medical pedagogy make little, if any, attempt, to contest disciplinary categories, let alone disciplinary categorization itself. Working under categorical disciplinarity in turn thwarts holistic interventions at every turn because disciplinary fragmentation, which is to say, categorical distinctions between cognitive styles, operate. Truly holistic healthcare, by contrast, would only be feasible with something akin to an integrating cognitive style. As if to confirm that the integration required by holism cannot occur without significant disciplinary political work, cognitive scientist Margaret Boden considers integration at once the "only true form" of interdisciplinarity and a destabilizing force to disciplines themselves (20). For integrative interdisciplinarity is a situation, Boden writes, "in which disciplines are rigorously – politically – exposed at their frontiers to the risk of skirmishes, invasions, violence, change and death, with no horizon of quiescent knowledge in view" (20-21). The high political stakes of integrative interdisciplinarity – together with no guarantees that it would create new knowledge – offer a satisfying explanation for why a holistic healthcare would decline to do the work that this dissertation proposes. At the same time, this work is necessary if there is to be any possibility of holistic healthcare: critical examination of disciplinary categorization so as to begin to imagine how possibly to move beyond categorical disciplinarity.

To further understand how addressing disciplinary issues may be paramount to creating holistic healthcare, the discussion below will consider six holistic interventions, two for each arm of the Flexnerian Enterprise, which have tried holistically to rethink patient care, medical

education and research but have not contested disciplinary categories. The holistic patient care endeavors are the biopsychosocial model and integrative medicine. The holistic research endeavors are General Systems Theory and integrative physiology. The holistic medical pedagogy endeavors are narrative and schema-based medicine. Discussing each set of projects together as pairs, a description of the characteristics that qualify each pair as holistic interventions precede assessments of how categorical disciplinarity operates within them. The purpose of the descriptions is not simply to provide sufficient background information for understanding the critiques but to also develop a genuine appreciation for the stakes, challenges and innovations of these particular attempts at holism as well as of attempting holistic health care in general. The first part of the chapter presents the descriptions of the six projects, amounting to a comprehensive picture of how all three arms of the Flexnerian enterprise have imagined holistic versions of themselves. The second part of the chapter presents the critiques centering around their handling of categorical disciplinarity.

2.2 DESCRIPTION: SIX ATTEMPTS AT HOLISTIC HEALTHCARE IN THE FLEXNERIAN ENTERPRISE

The rise of General Systems Theory in the 1940s, the emergence of the biopsychosocial model and the early medical humanities in the 1970s, the establishment of integrative medicine in the 1990s, the appearance of integral physiology and the further development of higher impact medical humanities in the 2000s have made for nearly seven decades worth of holistic alternatives to biomedical conventions. The search for holistic alternatives not only continues as the beginning of another decade approaches but seems to have accelerated. The earnestness of a desire for holistic

healthcare is perhaps matched only by the tremendous challenges, at once intellectual, logistical, ideological, economic and political, that achieving it presents.

2.2.1 Holistic Patient Care – The Biopsychosocial Model and Integrative Medicine

First introduced in a 1977 *Science* article by psychiatrist George Engel, the biopsychosocial model soundly rejects the foundational biomedical premise that biochemical and physiological factors are the ultimate criteria defining disease by expanding the notion of health to include the psychological and the social. In so doing, Engel sought "to fill a strongly felt need: that of uniting the disparate elements of human life in such a way as to legitimize a holistic approach" (McLaren 91). One way to ascertain what the biopsychosocial model was striving for in the way of social, psychological and biological-oriented patient care is to consider a comparison that Engel draws in his 1977 article between diabetes and schizophrenia, two diseases made categorically different by biomedicine's insistence on empirically verified physiological causations of disease. Without evidence for etiology or physiological causation, schizophrenia falls into the category of psychological disease whereas diabetes, a condition for which such evidence exists, falls into the category of somatic disease. With the diabetes-schizophrenia comparison, Engel endeavors to dissolve not only the categorical difference between somatic and psychological disease but also that between disease and its lived experience. From six philosophical observations about patient care, Engel constructs six points of comparison along which to consider these and other distinctions anew. The somatic-psychological divide as well as the disease-illness divide, while not completely dissolved, are at least weakened in the reflective space generated by these six observations about clinical medicine:

1) *Somatic defect is a necessary but not sufficient condition for clinical variability.* In the event that the discovery of a convincing, widely-accepted biochemical explanation for schizophrenia gave it the same clinical status diabetes enjoys as a so-called somatic disease, it still would not account for the clinical variability of schizophrenia any more than insulin deficiency does for diabetes. The clinical picture of any condition can exhibit considerable variability, which can also include but is certainly not limited to a suite of what Engel calls "core clinical manifestations" (132). The core clinical manifestations for schizophrenia include such positive features as hallucinations, delusions and agitation and such negative features as anhedonia and attentional impairment. The clinical manifestations of diabetes are excessive urination (polyuria), excessive thirst (polydipsia) and weight loss, among many others. To be sure, diabetes and schizophrenia need not present with all of these symptoms. Five identical laboratory results may in fact accompany five different combinations of the core clinical manifestations of diabetes. Since the biochemical defect does not exhaust the variability of clinical picture, consideration of psychological and social factors is always needed in order properly round out the clinical manifestation.
2) *Finding correlations between bodily processes and clinical data requires a rigorous approach to assessing and documenting behavior.* Ascertaining "core clinical manifestations" in the first place presupposes an understanding of the "psychological, social and cultural determinants of how patients communicate the symptoms of disease" (Engel 132). By assuming a standardized mode of communication, the biomedical model discounts the influence of language and culture as potentially confounding mediators in the collection of crucial clinical data related to such as ostensibly simple activities as going to

the bathroom, where a few core clinical manifestations of diabetes arise, or more complex behavior like paying attention, a core clinical manifestation of schizophrenia.

3) *Living conditions are a variable in disease onset and progression*: "Psycho-physiological responses to life" influence such clinical considerations as "time of onset, the severity and course of a disease" (Engel 132). Discounting both the psychological reactions to life events, disease and disease as life events, along with intervening social factors, impoverishes the understanding of these three crucial clinical factors. Insulin deficiency in a high stress, urban food desert inundated with low-cost, high-fructose food is different than insulin deficiency in a slower-paced, rural community surrounded by farmers' markets. Likewise, schizophrenic hallucinations in a supportive, tolerant environment are different from those in a hostile, fearful environment.

4) *Non-biochemical factors play a role in patienthood:* Though the biomedical model obliges anyone on the receiving end of an abnormal biochemical finding to assume the status of sick person or patient, it makes no provisions for when that status is rejected. The rejection of patient-hood out of a felt sense that the abnormal finding is wrong could lead to the correction of such mistakes as a simple misinterpretation of a biochemical finding or even a technical error leading to a patently inaccurate finding. In the event that there is no such mistake and the client simply resists the news, there is no provision in the biomedical model to make any effort to engage the resistance on its own terms. Therefore, abnormal hemoglobin A1c finding, a crucial tool for establishing a diagnosis of diabetes, may, under certain circumstances, be no more convincing to the would-be diabetic than documentation of hallucinatory behavior is to the would-be schizophrenic. With psychological or

sociological insights, the rejection of patienthood could be better understood and possibly overcome so that treatment could proceed.

5) *Somatic treatment does not necessarily restore health:* Perhaps the most persuasive reason for the consideration of psychological and sociological factors as routine medical practice, as well as the damaging rebuke of the classical biomedical model, is the discrepancy between "correction of biochemical abnormality" and "treatment outcome" (132). To the extent that the biomedical model promises a restitution of health, any dissatisfaction following the repair of the biochemical defect suggests that the biomedical model's *de facto* theory of health as a function of primarily biochemical activity is insufficient. In the event that schizophrenia could be pharmacologically managed to the same extent insulin injections and other interventions manage diabetes, these interventions themselves exert effects that may or may not restore well-being.

6) *The physician-patient relationship influences clinical outcome:* Engel maintains without question that the influence of the physician-patient relation extends even to somatic diseases like diabetes, to say nothing of psychiatric diseases like schizophrenia. In either situation, the trust a patient has for a physician plays a role in whether the former will accept the findings and recommendations of the latter. Trust is still consequential in a somatic disease like diabetes considering physician recommendations will likely include potentially difficult or inconvenient diet and lifestyle adjustments. The incapacity of biological factors to promote trust justifies psychological and sociological considerations.

Perhaps the most striking theme to emerge from Engel's six-part clinical justification for the biopsychosocial model is that the biomedical model, on top of advancing a limited, even impoverished notion of health, does not even make the provisions necessary for achieving the

attending goals of that limited notion. To the extent that the biomedical model seeks, as its primary clinical goal, to develop a detailed clinical picture built of reliably collected clinical data for the purpose of restoring a biologically-determined state of health, it is self-defeating to discount possible distortions of that data by language or culture and to ignore the influence psychosocial variables have on biochemical process, the primary constituents of health and well-being as determined by biomedical values. Scant attention to either the doctor-patient relationship or the resistance to assuming the positions that permit biomedical intervention further highlights the possibility that the biomedical does not equip itself with all available tools useful in the fulfillment of the clinical goals and ideals it sets for itself. Engel's fifth observation, crucially, dispels the convenient assumption that addressing the weaknesses elucidated in the other points is all that would be needed to perfect the biomedical model. The instance of dissatisfaction with the state following management of or complete repair to the somatic defect would spell the impoverishment of biomedicine's notion of health, justifying a completely new model.

Engel's justification for a new model cannot be separated from his own area of clinical expertise, psychiatry, the medical specialty harboring the greatest ambivalence to biomedicine. This ambivalence is in fact the subject of the *mise-en-scène* that opens the 1977 article introducing the biopsychosocial model. Against the backdrop of a conference on psychiatric education, various voices cry for psychiatry's strict adherence to the biomedical model. One "critical" voice, rendered anonymous by Engel to create an almost symbolic or archetypical effect, considers psychiatry "'a hodgepodge of unscientific opinions, assorted philosophies, and 'schools of thought,' mixed metaphors, role diffusion, propaganda, and politicking for 'mental health' and other esoteric goals'" (Engel 129). In contrast to psychiatry, the rest of medicine is "neat and tidy" (129). Engel names the two proposed solutions to the crisis: 1) "removal of the functions now performed by

psychiatry from the conceptual and professional jurisdiction of medicine and their reallocation to a new discipline based on behavioral science" or 2) strictly defining psychiatric disease as biochemical or neurophysiological in nature (129). Both solutions revolve around a central pivot point: the biomedical model. Either psychiatric disease conforms to the model or it is expelled from the medical profession altogether.

Rather than join one of the two camps, Engel opts for a solution that seeks to deliver psychiatry from its crisis of ambivalence by addressing nothing less than the pivot around which that ambivalence fluctuates: the biomedical model. If those that favor psychiatry's expulsion from the medical profession are biomedical "apostates" and the "true believers" are those that support its remaining under medicine's purview on the condition of rigid conformation to biomedical principles, then Engel advocates for a "heretical" position (130). In the search for an altogether new faith, Engel recommends that psychiatry not simply abandon its assorted, potentially-flawed philosophies and schools of thought. In so doing, he invites the accusation that he obstinately and irresponsibly defends psychiatry's alleged messiness merely to spite the pristine biomedical model he does not like. However, the stark contrast between messy psychiatry and tidiness of the other specialties that begins his article points to a different explanation. The contrast merits a Dorian Grey analogy: psychiatry is to biomedicine as the portrait is to Dorian. Saddled with the unhappy lot of registering the biomedical model's deepest messiness, inconsistencies and problems, psychiatry is the horrifying portrait that allows the rest of biomedicine to retain a rational gleam as it proceeds unpunished down its path. According to the logic of this analogy, Engel's celebration of psychiatry's messiness would seek to register the disturbing but urgent truth of the biomedical model's sins. It follows that any attempt on psychiatry's part to clean up its act by either excising itself from or conforming to the biomedical model only perpetuates a problem that, in Engel's

estimation, cannot be solved by merely redistributing labor across the same, longstanding professional boundary lines constituted, or at least, bolstered by a biomedical account of health.

The biomedical dogma around which the contested lines of professional territory are drawn is none other than the assumption that the biopsychosocial model fundamentally rejects, namely, that biological indices are "the ultimate criteria defining disease" (Engel 133). Engel rejects this assumption on the grounds that it generates a "paradox" in which "some people with positive laboratory findings are told that they are in need of treatment when in fact they are feeling quite well, while others feeling sick are assured that they are well, that is, they have no 'disease'" (133). Engel's biopsychosocial model resolves this biomedically-induced dualistic paradox by "encompass[ing]" both sides of it. The 1977 article gives little indication of what such encompassment means or how it would solve such paradoxes as the one Engel describes. The means of encompassing can be inferred, however, and betray a relationship to disciplinarity that would thwart the holistic-patient care efforts Engel sought.

Though Engel's neologism – biopsychosocial – endures, the goal of providing more holistic approaches to patient care at some point fell under the responsibility of Integrative Medicine. In recent decades, Integrative Medicine has achieved a level of professionalization the biopsychosocial model arguably never did. The professional organizations that extend the reach of integrative medicine include: The American Academy of Integrative Health and Medicine (AAIHM); the American Board of Integrative Medicine (ABIM), which administers the exam that leads to board certification in integrative medicine; The Consortium of Academic Health Centers for Integrative Medicine, which consists of integrative medicine programs at sixty-two institutions, or forty percent of all major universities and health centers across the United States and Canada.[6]

[6] Statistic from *Integrative Medicine* (Rakel), page 3.

In most cases, the programs offer post-residency fellowships in integrative medicine, which physicians must complete in order to sit for the board certification exams.

General definitions of integrative medicine abound, each professional institution offering its own vision. The vision statement on the AAIHM website lists "establish[ing] a new paradigm of health care" as one of its visions, recalling Engel's ambition to develop healthcare that moved away from the biomedical model (Medicine). The definition of Integrative Medicine given by the website of the ABIM and the Consortium of Academic Health Centers for Integrative Medicine is "the practice of medicine that reaffirms the importance of the relationship between physician and patient, focuses on the whole person, is informed by evidence, and makes use of *all* therapeutic approaches, healthcare professionals and *disciplines* to achieve optimal health and healing" (Specialites, italics mine). Though perhaps lacking the strong sense of redefining health care that the AAIMH mission espouses, this definition nevertheless advances an all-encompassing vision that does not leave any consideration out of the healthcare process. The consortium members echo this wide-ranging inclusiveness. Duke University's Integrative Medicine program proclaims: "with an emphasis on prevention and wellness, we offer an array of evidence-based treatment modalities that address the whole person – mind, body, spirit, and community" (University). In sum, the image of integrative medicine that endures across the various vision or mission statements shows an approach that does not make any disqualifications out of hand as to what care should consist of, seeking in many cases, as its name suggests, to integrate as much as possible into the health care approaches.

Though undoubtedly situating integrative medicine in a holistic vein, these mission statements offer little indication of what the holistic patient care attempted by integrative medicine actually looks like. The route to board certification by the ABIM proves more helpful in this regard.

A view of integrative medicine's patient emerges with its board exam, of which there are nine content areas: 1) Nutrition; 2) Dietary supplements, botanicals and other natural products; 3) Mind-body medicine and spirituality; 4) Complementary and Alternative Therapies; 5) Whole Medical Systems; 6) Lifestyle, prevention and Health promotion; 7) Integrative Approaches (including conventional medicine); 8) Foundations of Integrative Medicine; 9) Professional Practice of Integrative Medicine. With these content areas, a speculative sketch of an integrative medicine clinical encounter becomes possible:

A young woman presents with a persistent pain in her stomach that has, perhaps, confounded the many general practitioners or specialists with whom she has previously consulted. Working from a nutritional perspective (Content Area 1), the integrative medicine practitioner could take a strong look at her dietary habits from various perspectives – what food she eats, how much, when and what combinations – and advise different options that could or could not include interventions other than food (Content Area 2). The practitioner might also consider emotional factors (Content Area 3) while trying to situate them in relation to career, family, community (Content Area 6). For immediate relief from the pain, the practitioner might consider abdominal oil massage as practiced in Ayurvedic medicine (Content Area 5) along with prescriptions or drug combinations that previous practitioners may have overlooked (Content Area 7).

With this sketch, it is perhaps easier to imagine the working definition of holistic medicine given in the previous chapter as a partaking of infinite therapeutic targets. Whereas strict adherence to the biomedical model would seek to identify the physiological or biochemical defect in the patient's stomach or surrounding organs, the integrative medical approach attends to far more than physiology or biochemistry and offers therapies that do not center on either.

The sketch, of course, also raises the preeminent disciplinary challenge of holistic healthcare. Even a cursory glance of the content areas raises such clinical issues as the process by which an integrative medicine practitioner moves between conventional practices and complementary therapies or how he determines which of the six or so world medical systems tested in the fifth content category would best serve a patient. The answers to these crucial questions, which would indicate the means by which he could detect errors or omissions in his clinical judgment, would presumably be found in either Foundations or Integrative Approaches. The textbook listed as the primary reference material for exam preparation, David Rakel's *Integrative Medicine* (2003) gives an impression of what constitutes integrative medicine's integrative measures while providing one account of integrative medicine's relationship to two terms with which it is often conflated: alternative medicine and complementary medicine.

In the first of three paragraphs on the "Integration" section of the textbook's eleven-page Philosophy chapter, Rakel writes that integrative medicine's integrative measures rest on "good science" and neither reject conventional medicine nor haphazardly accept alternative practices (Rakel 9). The second paragraph scrutinizes the reception of Complementary and Alternative Medicine (CAM), a collection of healing tools related to but not synonymous with Integrative Medicine. Presented as the evolutionary phase preceding the emergence of Integrative Medicine in the 1990s, CAM is regarded as a set of tools underutilized by mainstream practice but taken seriously in Integrative Medicine. The third and final paragraph emphasizes that "integration involves a larger mission that calls for a restoration of the focus on health and healing based on the provider-patient relationship" (Rakel 9). Though Rakel rightly emphasizes a larger mission, there is little in the textbook that further clarifies this mission in itself.

The majority of the textbook instead consists of integrative approaches to numerous conditions, as defined or at least influenced by the diagnostic categories of biomedicine. Each condition receives its own chapter, written by an expert contributing author. An important feature of every chapter is the therapeutic review, a quick-reference summary of all the approaches recommended for the corresponding condition. Figure 3 shows an example of a therapeutic review for chronic kidney disease:

Figure 3: Therapeutic review for chronic kidney disease from Integrative Medicine

THERAPEUTIC REVIEW

GENERAL

- Optimize weight, control hypertension, diabetes mellitus, and dyslipidemia (B 1)
- Avoid potential nephrotoxic medications and volume depletion (C 1)

DIET

- Maintain a balanced antiinflammatory, low pollutant, alkalinizing diet (B 1)
- Lower animal protein and sodium (B 2)
- Avoid sugar, processed food, inorganic phosphate additives, and artificial sweeteners (C 1)
- Add raw nuts, prebiotics, probiotics, and fiber-containing foods (C 1)
- Elimination diet (gluten-, dairy-, casein-free) in cases of glomerulonephritis (C 1)
- Avoid high-oxalate and high-purine diets (C 1)

LIFESTYLE

- Exercise regularly (B 1)
- Smoking avoidance/cessation (A 1)
- Practice mind-body modalities, such as gentle yoga, tai chi, and meditation (C 1)
- High quality sleep, address obstructive sleep apnea, minimize stress (C 1)

DETOXIFICATION

- Discontinue exposure to environmental toxins (C 1)
- Chelation for heavy metal toxicity (B 3)
- Chelation to decrease heavy metal total body burden (B 3)
- Dental amalgam removal (C 2)
- Avoid herbal medicines and fish contaminated with heavy metals (C 1)
- Avoid plastic food and beverage containers (C 1)
- Drink pure water (C 1)

PHARMACEUTICALS

For the management of hypertension, anemia, bone disease, lipids in CKD follow the KDIGO and/or Kidney Disease Outcome Quality Initiative (KDOQI) guidelines (variable levels of evidence)

- Magnesium (not to exceed upper limits of normal) (C 2)
- Sodium bicarbonate or Shohl's solution (to keep serum bicarbonate levels between 22–24 mmol/L) (B 2)
- Febuxostat 10–40 mg/day for hyperuricemia (B 2)
- Losartan 50 mg/day or irbesartan 50–150 mg/day for hyperuricemia with hypertension and type 2 diabetes mellitus (B 2)
- Allopurinol 50–300 mg/day for hyperuricemia (B 2)

SUPPLEMENTS

- Omega 3 fatty acids 2–6 g/day (B 2)
- Vitamin D 25-OH (C 2)
- Probiotic supplements (C 2)

HERBALS

- Turmeric (Curcumin) 500–2000 mg/day (B 2)
- *Astragalus membranaceus* (huang qi)* 15–40 g/day (B 2)
- *Cordyceps sinensis** 1–5 g/day (B 2)
- *Ligusticum wallichii* (*Ligusticum chuanxiong*, ligustrazine)* 40–400 mg/day (B 2)
- *Tripterygium wilfordii* Hook F (lei gong teng)* 12–15 g/day (B 3)
- Rhubarb root 6–15 g/day (B 3)

ALTERNATIVE THERAPIES

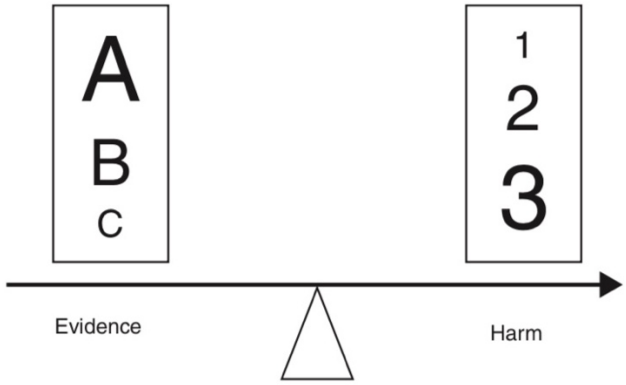
- Ayurveda (B 2)
- Traditional Chinese medicine (B 2)
- Acupuncture (B 1)

The therapeutic review shows the operation of Integrative Medicine's primary tool of disciplinary constraint: Strength of Recommendation Taxonomy, or SORT. The clock or dial-looking icon next to each intervention renders the information provided by SORT.

SORT functions as a five-tiered rating system that weighs the harm of a particular intervention against evidence for its benefit. Each tier corresponds to the strength of a particular recommendation. Figure 4 below shows the figures from the textbook that explain how to read the system:

Figure 4: The Disciplinary Constraint of Integrative Medicine ***A)*** *The figure from Integrative Medicine showing the literal weighing of evidence for benefit versus harm. A corresponds to a rating for the strongest evidence of benefit, C the lowest. 1 corresponds to the smallest potential risk, 3 the largest.* ***B)*** *The five-tiers corresponding the five strengths of recommendation, which are based on where the balance between benefit and potential harm falls. The five strengths correspond to five "positions" that the balance of benefit and harm can take under the SORT system.*

A)



B)

Rating Options	Arrow	Icon
(A,1)	↑	A 1
(A,2) (B,1)	↗	A 2 B 1
(A,3) (B,2) (C,1)	→	A 3 B 2 C 1
(B,3) (C,2)	↘	B 2 C 2
(C,3)	↓	C 3

The textbook's description of the evidence-harm weighing process illustrates how SORT provides a measure of disciplinary constraint for integrative medicine. The description concerns the use of the medication spironolactone in cases of severe heart failure. Following a study in the *New England Journal of Medicine* that demonstrated the benefits of spironolactone, physicians in Ontario, the textbook explains, Canada started prescribing the drug more often. However, the follow-up study that documented this trend also noted the increase in hyperkalemia-related deaths precipitated by adverse reactions between spironolactone and ACE inhibitors. Just as the study concludes that the increased incidence of fatal hyperkalemia outweighs the potential benefit, so too does SORT organize all the data surrounding a particular intervention to render a rating that helps the integrative physician quickly assess its potential use.

The explanation of SORT ends with the revelation that clinical decision-making "is grounded in the much broader insights obtained through relationship-centered care" (Rakel xxv). The appeal to the physician-patient relationship, while upholding a declared value of integrative medicine, nevertheless, defers the actual work of enhancing that relationship while highlighting SORT's limited utility in the way of integrative theory that would further the work of integrated clinical decision-making that, as Rakel continually emphasizes, goes beyond the mere collection and creation of additional healing tools. As the critique in the second part of the chapter will attempt to show, the lack of integrating work is coupled to categorical disciplinarity.

2.2.2 Holistic Research – General Systems Theory and Integral Physiology

Amidst the incessant pace of disciplinary specialization in the twentieth century, one of the few intellectual endeavors that could reasonably claim the title of holistic research is General Systems Theory, which emerged in response to increasing concern with the hyper-specialization of the

sciences. It is for this reason that Engel likely had few other options in the way of theoretical foundations for his biopsychosocial model. Engel considered General Systems Theory the "conceptual approach" of the biopsychosocial model and spoke confidently that it would uncover "fundamental laws and principles that operate commonly at all levels of organization" (196). With General Systems Theory, its creator, the Austrian theoretical biologist Ludwig von Bertalanffy, indeed envisioned something that could be taken as the means of cohering the biological, psychological and sociological:

> We are certainly able to establish scientific laws for the different levels or strata of reality. And here we find, speaking in the "formal mode", a correspondence or isomorphy of laws and conceptual schemes in different fields, granting the Unity of Science. Speaking in "material" language, this means that the world (i.e., the total of observable phenomena) shows a structural uniformity, manifesting itself by isomorphic traces of order in its different levels of realms. (Bertalanffy 87)

The Unity of Science postulated by Bertalanffy in turn constituted the basis for General System Theory's central ambition: developing a language into which the problems of the disciplines could be translated for eventual solution. The language, had it come to fruition, would have, in the words of Bertalanffy's collaborator, Kenneth Boulding, functioned as a "'gestalt' in theoretical construction" that would have in turn "direct[ed] research towards the gaps" (Boulding 198). An example of such a gestalt is the Periodic Table of Elements, which "directed research for many decades towards the discovery of unknown elements to fill gaps in the table until the table was completely filled" (Boulding 198). Whereas the Periodic Table only guided research in one field, chemistry, the language General Systems Theory sought to create would have extended to all fields, amounting to a "spectrum of theories, a system of systems" (Boulding 198) that researchers

from across the intellectual world could have consulted for guidance in filling holes or solving in their respective disciplines.

Fittingly, the most basic grammatical unit of this language was the system. The sixth and seventh theses of Fred Waelchli's "Eleven Theses of General Systems Theory" explains that this basic unit occupies a "logically *higher*-order" position over "*all* the other scientific and social disciplines, and most particularly, of the so-called 'Scientific Method' itself" (Waelchli 6). From this logically elevated, which is to say, logically all-encompassing position, the system functions as a "searchlight to illuminate structural similarities in the laws of the divergent human 'content' disciplines" (Walechli 5). This searchlight capability consists of discovering and articulating isomorphisms and homomorphisms. Waelchli describes the former as a one-to-one mapping of a given system's elements, attributes and element-attribute relationships on *to* another system, the latter a many-to-one mapping that *preserves* the same *in* another. Waelchli gives a familiar example of the homomorphism: The U.S. House of Representatives. The House, Waelchli writes, "was designed to be a homomorphic model of the U.S. body politic" (5). Bertalanffy gives a six-constituent example of isomorphism between disciplines when he writes that "the exponential law or law of compound interest, applies, with a negative exponent, to the decay of radium, the mono-molecular reaction, the killing of bacteria by light or disinfectants, the loss of body substance in a starving animal, and to the decrease of population where the death rate is higher than the birth rate" (von Bertalanffy 136). Bertalanffy's positing of isomorphism existing between laws from economics, physics, microbiology, animal physiology and demography helped to justify the projections of the wide reach that General Systems Theory would have.

Waelchli goes on to illustrate how the isomorphic nature of General System Theory's meta-system language would have solved disciplinary problems by considering the logically nonsensical

statement, "Washington is a city is a sentence." The statement's syntactical nonsense is, per Waelchli's metaphor, the equivalent of a problem with which a discipline may be struggling. Since the unit "Washington is a city" bears structural similarity to a sentence system (i.e. a verb establishing a relationship between two nouns to render a complete thought), a sentence system can be grafted on to it, giving a statement that makes sense: ''Washington is a city' is a sentence.' Likewise, a higher order language of systems would have offered statements about systems that could be morphically grafted on to the problem in order to either resolve a paradox or clarify the nature of what was missing so that research could proceed to fill the hole.

Since GST's jurisdiction extended over all disciplines, it sought to cultivate limitless interdisciplinary systems grafting and thereby extend its problem-solving capabilities across physics, biology, chemistry as well as economics, sociology, political science, and every discipline in between. GST derived the guarantee that such grafting would resolve paradoxes and fill gaps from the theoretical belief in the unity of universe, which the disciplinary division of labor had distorted. Insofar as it sought to restore that unity through meta-systemic problem-solving, GST had the makings of the twentieth-century heir to Schiller's "philosophical head," which Schiller conceived as restoring the unity of knowledge broken by the fragmentary abstractions of the intellect. In this way, General Systems Theory sought to do what seemed impossible in a research landscape defined by specialization that resolved into increasingly smaller parts: create a means of working from a perspective of wholes rather than parts.

Just as Engel allied his biopsychosocial model to GST's holistic research operation, so too does integrative physician Dr. Leonard A. Wisneski seek to ally his field to what is perhaps integrative medicine's answer to General Systems Theory: integral physiology. In Wisneski's *The Scientific Basis of Integrative Medicine* (2009), integral physiology has the makings of the holism-

seeking generalizing interdisciplinarity of General Systems Theory. Wisneski evokes as much by comparing integral physiology to what his interlocuter, Dr. Jeff Levin, calls a "new generalist perspective," which will be "based on something akin to a 'unified field theory' of the determinants of health and healing" (Levin 224, quoted in Wisneski xxix). Wisneski proposes that the major innovation of this unified field theory will be to bring "subtle-energy into the mix" (Wisneski and Anderson xxiv). Understood as the types of energy fields undetectable by the five senses and current scientific instrumentation, subtle energy's entry into integral physiology would effect, in Wisneski's view, a fusion of Western and Eastern healing traditions. Aside from its mention in Wisneski's book, integral physiology as a "unified field theory" seems to have received little attention and development, greatly restricting the comparisons that can be made between it and General Systems Theory. In the event that the project of integral physiology as Wisneski envisions it was taken up under the same or different name, it would, however, risk falling into the same disciplinary traps that thwarted General Systems Theory.

2.2.3 Holistic Medical Pedagogy – Narrative and schema-based medicine

Patient care and research did not completely overshadow medical education in Engel's mind as he contemplated the possibility of a biopsychosocial model. Having predicted that a "greater readiness to encompass a biopsychosocial perspective of disease" would follow the integration of a general systems approach into the "basic science and philosophic education of future physicians and medical scientists" (135). , Engel no doubt considered the formative role that education plays in any research or patient care success, let alone any major innovation in either domain. But while Engel may have heeded medical education's importance, no General Systems Theory-oriented pedagogy was ever devised, let alone implemented in medical education. As for Integrative

Medicine's contributions to medical education, the proliferation of integrative textbooks and training programs indicate a comparatively more established pedagogical effort, albeit one that only extends so far. As integrative medicine is a board-certified medical specialty, exposure to integrative principles mostly occurs after graduating from medical school, where adopting integrative approaches is entirely self-determined. Little change to earlier levels of medical training forecloses the presence of integrative principles in the foundations of an allopathic physician's education.

To the extent that Integrative Medicine and the biopsychosocial model developed research and clinical goals to the detriment of developing holistic curricular recommendations for post-baccalaureate medical education, they could not be said to have mounted a recognizable holistic intervention in the fundamentals of medical pedagogy. Instead, the holistic pedagogical intervention occurred by way of the many scattered efforts to introduce knowledge from outside the traditional basic science disciplines into the medical curriculum. These efforts gave much needed attention to medical education, the "most endangered" arm of the Flexnerian enterprise (Ludmerer xxv). So while not formally allied to and diverging in many crucial theoretical and methodological ways from the previously discussed efforts at holistic patient care and holistic research, these projects arguably do the equivalent of holistic work in the underprivileged domain of medical pedagogy.

Incidentally, the rise of various efforts to enrich the science-oriented medical curriculum in the 1970s coincided with the biopsychosocial model's appearance in 1977. Together, these efforts made both direct and indirect cases for holism by attempting to challenge, in various ways and to various degrees, the same central biomedical assumption with which Engel took issue. Indeed, perhaps the sole common thread binding the now heterogeneous assortment of projects

striving to carve out space for the arts, humanities and social sciences in medical education is that they challenge the biological and the scientific as the final words on health and knowledge, respectively. The development of these efforts is messy and uneven, making the attempt to cohere them under a particular rubric perilous at best. Merely distinguishing them from other longstanding efforts such as bioethics indeed poses difficulties, as indicated by the genealogy of the periodical currently known as *The Journal of Medical Humanities.* At the time of its inaugural publication in September 1981, the journal was known *Bioethics Quarterly*. In March 1982, it became *Journal of Bioethics*. Three years later, medical humanities became a part of the title, giving *Journal of Medical Humanities and Bioethics*. Finally, in March 1989, bioethics was dropped, leaving what is still the publication's current title.

Incidentally, the medical humanities is the name that has arguably been most used to signify the integration of material outside the basic sciences into the medical curriculum. Alan Bleakley speaks of a first wave medical humanities appearing in the 1970s whose disciplinary range consisted of ethics, history of medicine, narrative-based medicine and close noticing of visual artworks. The delivery of these courses through optional learning and supplementary modules was typical of the "non-compulsory" character of first-wave efforts to expose medical students to diverse perspectives from outside the basic sciences (Bleakley 47). What marks the distinction between the first and second waves was higher impact educational interventions. The term "medical humanities" has since fallen out of favor because of its exclusion of non-medical factors in health and has been replaced by the health humanities, as cemented by the 2014 anthology *Health Humanities Reader*.

Some medical or health humanities projects have a more pronounced holistic medical pedagogy ambitions than others. One such project, narrative medicine, which "has followed

(indeed, often replaced) the biopsychosocial model," looks to the narratives of literary art as both a means of effectively inculcating narrative competence (Solomon 195). Physician and English literature scholar Rita Charon, who coined narrative medicine, defines narrative competence as "the ability to acknowledge, absorb, interpret and act on the stories and plights of others" (Charon 1897). Narrative competence has holistic aspirations insofar as it is presented as a manner by which "research proceeds, teaching succeeds, clinical colleagueship achieves its goals, and the profession of medicine remains grounded in its timeless, selfless commitment to health" (1899).

A close relative of narrative medicine is schema-based medicine, which looks to literary art to help both medical students and health professionals develop frameworks that allow them to extract aspects of a given situation or clinical case that an exclusively science-oriented schema would miss. Such frameworks, or schemas, "help habituate three sets of pragmatic skills: listening, interviewing and active, virtuous behavior with patients" (Schleifer and Vannatta 20-21). One core schema is the chief concern. Whereas the framework inherent to the traditional chief complaint narrows in on, perhaps even selects for, a biomedical description of disease, the chief concern schema broadens the clinical scope à the biopsychosocial model to situate the bodily complaint within and attune the physician to a broader picture of the patient's life.

Whether classified under the second wave medical humanities rubric or health humanities rubric, narrative and schema-based medicine emerge nevertheless as high impact projects seeking to promote holistic medical pedagogy. Perhaps the strongest justification for this characterization is their fundamental goal of tying holism to a single humanistic skill: rigorous narrative knowledge. In the case of schema-based medicine, the capacity for empathy is grounded in a sense of wholeness, which can be cultivated through narrative study: "the imaginative understanding of the whole situation in empathy – the scene of narration in the patient-physician relationship – links it

powerfully to the goal of grasping the meaningful whole of narrative" (Schleifer and Vannatta 160). Similarly, narrative medicine "has come to understand that patients and caregivers enter whole – with their bodies, lives, families, beliefs, values, histories, hopes for the future – into sickness and healing, and their efforts to get better cannot be fragmentated away from the deepest parts of their lives. In part, this wholeness is reflected in – if not produced by – the simple and complicated stories they tell to one another…" (Charon, *The Principles and Practice of Narrative Medicine 13*). Narrative competence, or the capacity to respond deeply to stories, can thus be understood as an engagement with the wholeness of the person and the medical situation. Thus, as high impact educational interventions, both narrative and schema-based medicine use literary techniques to advance holism in medical pedagogy and practice, amounting to a coordinating interdisciplinarity that works, broadly speaking, across the traditional boundaries separating the disciplines of literature and medicine.

Taking narrative and schema-based medicine and conventional biomedicine as the constituents of cooperative interdisciplinarity presupposes three factors: 1) a common goal, 2) complementary skills and knowledge and 3) the negotiation of that complementarity. Even a cursory understanding of narrative and schema-based medicine would reveal that these three factors clearly exist. The common goal is something akin to improving medical care and addressing long-standing inequities in healthcare systems. As for complementary skills and knowledge, narrative medicine regards the basis of complementarity as a function of narrative, writing that "medical practice unfolds in a series of complex narrative situations, including the situations between the physician and the patient, the physician and himself or herself, the physician and colleagues, and physicians and society […] between the physician and his or her family, between patients and their family members, and among patients" (Charon, "Narrative

Medicine,"1898). In short, the many assorted situations in clinical practice where narrative plays a central role justifies the complementary role narrative training can play in medical training.

As for how schema-based medicine justifies complementarity of skills and knowledge, the philosophical school of American pragmatism plays a major role: "the ideas, concepts, and laws produced by the instrumental vocabularies of natural science *and* by the cognitive apprehensions of narrative are real. Thinking with Charles Sanders Peirce, we treat these concepts not as ontological truths antecedent to the inquiries that produced them – truths that exist once and for all – but as real in their function and in the consequences of their appropriate enactment in the clinic" (Schleifer and Vanatta 37, italics mine). This pragmatic philosophical foundation informs schema-based medicine's three categories of knowledge: 1) "the nomological or law-governed understandings afforded by scientific experimentation" that proceed by deductive reasoning 2) "the human sciences" such as evolutionary biology and cognitive science that proceed by inductive reasoning; 3) "*functional* knowledge, or the "pragmatic achievement of goals in the systematic pursuit of understanding," which proceed by a pragmatic kind of reasoning that Peirce calls abductive reasoning. It is this last category into which the narrative science of schema-based medicine falls (Schleifer and Vanatta viii). The authors specify the relation they propose between these three categories of knowledge: "the nomological sciences […] can be *complemented* by the human sciences, which depend on *schematic understanding* of forms and structures that govern experience, cognition and judgment more generally" (Schleifer and Vannatta viii, italics in original). In short, deduction, induction and abduction can all complement one another. Therefore, the basis of schema-based medicine's vision of complementarity rests, perhaps controversially, on the proposition that neither science and human science nor literature and narrative have access to truths that are true for all places and times.

The third factor of cooperative disciplinarity, the negotiation of complementarity, fully reveals narrative and schema-based medicine's discipline-preserving holistic interventions. The crux of the negotiation for narrative and schema-based medicine is what forms of knowledge get to count as what truths. By requiring the existence of multiple kinds of truth, both holistic medical projects not only throw the very concept of truth into question but also asks challenging questions as to how these various concepts shape various deployments of art for educational purposes. These deployments in turn can be shown to proceed according to conserved institutional couplings of ideology and disciplinary frameworks.

2.3 CRITIQUE – THE CATEGORICAL DISCIPLINARITY OF HOLISTIC INTERVENTIONS

All six holistic healthcare interventions preserve their own versions of categorical disciplinarity. While the content and shapes of the categories may shift around, the maintenance of categorical disciplinary structures remains in place. The basic tasks with which each arm of the Flexnerian enterprise is entrusted influence the form that the six projects' discipline-preserving holism take. The concerns of treating people cause the discipline-preserving holistic patient care to take the form of disciplinary supplementation, which is to say, the lumping together of disciplinary knowledge to create both fragmented pictures of health and arbitrary treatment strategies. The concerns of creating new knowledge about reality cause discipline-preserving holistic research to take the form of a meta-disciplinary *mathesis universalis*, which is to say, the pretensions of a universal science that seeks a logically superior position over all disciplines. Finally, the concerns of teaching medical students cause discipline-preserving holistic medical pedagogy to take the form of path dependent disciplinary coordination, which is to say, curricular approaches consisting

of skills from different disciplines that nevertheless relate these skills to one another across conserved patterns of disciplinarity and attending ideologies. Altogether, these three forms of discipline-preserving holism register an earnest desire to combine what categorical disciplinarity separated alongside an equally robust refusal to contest categorical disciplinarity itself.

2.3.1 The Biopsychosocial Model and Integrative Medicine – Holistic patient care as infinite disciplinary supplementation

Recalling that the biopsychosocial model's professed innovation was to encompass both sides of the biomedical paradox, Engel's 1977 article gives little any indication of what encompassment means or how it would solve this paradox. Absent additional development of this idea by Engel himself, it nevertheless bears the imprint of Engel's professed conceptual approach, General Systems Theory. From GST's elevated vantage point, the biopsychosocial model could obtain the perspective necessary to do the version of holistic patient care Engel sought: "evaluat[ing] all the factors contributing to both illness and patient-hood" and not "giv[ing] primacy to biological factors alone" (Engel 133). What Engel failed to realize was that the ability to rise above the disciplinary boundaries gives a false sense of having overcome the limitations of the biomedical model. Rising above the biomedical model and the disciplinary division of labor to which it is coupled meant leaving both intact.

The intactness of biomedically-associated disciplinary thinking appears in J.P. Bishop's assessment of what the human being becomes under the biopsychosocial model: "man *remains* a biological being with the addition of a psychological and sociological *overlay*" (Bishop 20, italics mine). In view of the biopsychosocial model's reliance on GST methodology, overlay becomes more than a figure of speech. The image of layering expressed by the verb 'overlay' corresponds

to GST's proposal of laying or mapping of systems on to one another so as to illuminate gaps in theory or create theoretical systems that resolve paradoxes or problems. With respect to Engel's patient care ambitions, the GST-facilitated overlaying of biological, psychological and sociological systems to create a more complete theory of health that could in turn guide holistic patient care. Engel notes with optimism the possibility for systems approaches to uncover "isomorphies across different levels of organization," from the molecule to the biosphere (196). "From such isomorphies," Engel reasoned, "can be developed fundamental *laws* and *principles* that operate commonly at all levels of organization" (196). In the absence of such laws, however, the picture of the human, or human health, nevertheless exists across a traditional pattern of disciplinary segmentation, with the biological segment still retaining preeminent status that biomedicine accords it.

Engel's intervention thus falls somewhere between leaving the biomedical in place and supplanting it. While Engel did take the crucial step of dislodging physiological factors as the ultimate criteria defining disease, or conversely, health, he lacked a satisfying answer for what constitutes health in biology's stead. His less than satisfying answer was to merely supplement additional knowledge to the understanding of health as the biological, again not realizing that in doing so, he relied on the same categorical disciplinary in which biomedicine operates. Engel sought to discover disease or health *itself* and while he may have removed one crucial obstacle to making that discovery in form of the mistaken belief that biological factors are the ultimate criteria of either, his answer initiated a process of serial supplementation that could only promise transitory satisfaction, before giving way to disappointment. That is, the promise of adding more disciplinary layers to a conception of health gives a temporary sense of having discovered it, which, after

providing a measure of satisfaction, eventually fades, opening up the next to attempt to do the same all over again.

Integrative medicine represents a subsequent stage in this process of serial supplementation. Though by all indications dropping the alliance that the biopsychosocial model shared with General System Theory along with the shared hope of discovering common laws operating at different levels of organization, Integrative Medicine nevertheless relies on supplementarity as a means of achieving holistic patient care. The creation of Optimal Healing Environments (OHE), one of integrative medicine's central holistic concepts, shows why. Defined by Rakel as an "*expansion* of Engel's biopsychosocial model," the OHE functions as "an environment in which the social, psychological, spiritual, physical and behavioral components of health care are oriented toward support and stimulation of innate healing capacities and the achievement of wholeness" (Rakel 12, italics mine). Whereas Engel's model discovers health by attempting to encompass biology, psychology and sociology, the Optimal Healing Environment discovers wholeness by attempting to encompass two additional factors, spirituality and behavior.

That this serial supplementation proceeds within a particular, if unspecified, disciplinary framework becomes clear in a later discussion in the chapter on creating OHE. In this discussion, Rakel mentions discipline explicitly, writing that "when professionals from varied disciplines come together, shared knowledge allows insight from different perspectives that can stimulate an 'ah ha!' moment in which new ideas allow them to transcend old models of care" (Rakel 17). Whatever the extent to which such disciplinary transcendence is tantamount to Engel's GST-facilitated encompassment of all health factors, the "ah ha" moments that underlies it do nothing to change the old, yet now "transcended" models of care. Ultimately, such disciplinary "ah-ha" moments signal the co-operative disciplinarity under which integrative medicine no doubt

operates. It should come as little surprise that the image of many disciplines with complementary knowledge working together for a common goal is a cardinal feature of a holistic healthcare approach that began from complementary and alternative medicine, or CAM movement of the 1990's. Such coordination no doubt brings disciplinary differences into sharper focus, along with facilitating beneficial patient care in the process, as Rakel's discussion suggests.

The less redeeming side of this cooperative interdisciplinarity is that as long as it serves as the sole disciplinary work in which Integrative Medicine engages, Integrative medicine comes no closer to escaping the fundamental criticism leveled at the biopsychosocial model for combining knowledge without first articulating a comprehensive way to unify that knowledge:

> Unless there is an integrating theory already in place gathering biological, psychological and sociological data about people will not only yield scattered lumps of information that do not relate to each other in any coherent sense. Without an overarching theory to integrate the fields from which the data derive, associations between differing classes of information are meaningless. (McLaren 91, italics mine)

The image of scattered lumps of information – whether biological, psychological, sociological, spiritual, physical or behavioral – not only supplies a clear image of disciplinary supplementation as holistic patient care but also the devastating effect of foregoing a unifying theory of health. While providing a tool for clinical decision-making and thereby functioning as a protective measure for patients, the Strength of Recommendation Taxonomy (SORT) by no means takes the place of a unifying theory. The importance of such a theory for Integrative Medicine lies in in how its disciplinary constraint helps to prevent haphazard jumping between world healing systems, mind-body medicine, conventional and alternative therapies and all other techniques of which integrative medicine partakes. SORT stands as a provisional measure to prevent gross clinical

errors, satisfying a criticism dogging unifying theories of health that argues holistic health care should not have to wait for a unified theory in order to treat patients holistically. SORT, however, becomes less defensible if it represents an abandonment of hope to one day develop such a theory.

For in the meantime, integrative medicine, like the biopsychosocial model, uses disciplinary knowledge as supplements to achieve holistic healthcare. At any time, the supplements could be put away, hastening a rapid return to strictly biomedical tools. On the other hand, the jumping between disciplinary approaches for which disciplinary supplementarity allows could, under extreme circumstances, amount to anarchy and a regression to the days of medical quackery. Granted, extreme circumstances may be rare and a degree of medical pluralism already exists. Physicians trained in the biomedical model can and do, for example, recommend Ayurvedic practices or yoga without it constituting anarchy. Moreover, the search for unifying theories proceeds. Though epigenetics research, for example, continues to derive associations between social and biological factors,[7] and the connections between the chakras of Ayurvedic medicine and the glandular system have been posited, these and other research efforts have not yet resulted in an integrative theory that elevates the meeting of sociality and biology, Ayurvedic medicine and immunology, above the condition of mere lumping. Without ongoing research to forge meaningful connections between the dimensions of health, the cooperative nature of Integrative Medicine in which various traditions and practices work together could never aspire to more than a fragmentary, treatment-lumping pluralism that, at best, confers some health benefits that biomedicine never could or, at worst, permits an anything-goes, free-for-all approach under the veneer of well-rounded, compassionate care.

[7] See, for example, Kuzawa and Sweet .

2.3.2 General Systems Theory and Integrative Physiology – Holistic research as meta-disciplinary mathesis

In "The Skeleton of a Science," an early proponent of systems thinking, Boulding defines General Systems Theory as a "a level of theoretical model-building which lies somewhere between the highly generalized constructions of pure mathematics and the specific theories of the specialized disciplines" (197). Whereas pure mathematics have no commitment to the real world, the theories of the specialized disciplines do. Boulding understands this connection to be derived from the disciplinary segmentation of reality:

> Each discipline corresponds to a certain segment of the empirical world, and each develops theories which have particular applicability to its own empirical segment. Physics, Chemistry, Biology, Psychology, Sociology, Economics and so on all carve out for themselves certain elements of the experience of man and develop theories and patterns of activity (research) which yield satisfaction in understanding, and which are appropriate to their special segments. (197)

In its intermediary position between the austerity of pure mathematics and the disciplines, General System Theory serves as the "skeleton of science in the sense that it aims to provide a framework or structure of systems on which to hang the flesh and blood of particular disciplines and particular subject matters in an orderly and coherent corpus of knowledge" (208). Together, the descriptions Boulding uses to develop the notion of General System Theory's holistic research project invoke the philosophical dream of a *mathesis universalis*.

Ludwig von Bertalanffy himself conceived of General Systems Theory as such, publishing an article in the 1957 *German University Journal* [Deutsche Universitätszeitung] with the striking title, "General Systems Theory: Way to a New Mathesis Universalis" [*Allgemeine Systemtheorie:*

Wege zu einer neuen Mathesis Universalis]. Despite its title, the essay gives little indication of how Bertalanffy conceived of mathesis universalis, a term that by itself engenders a range of understandings, let alone when considered alongside terms with which it could easily be conflated, including universal science, universal calculus or universal symbolism. The only explicit reference to the term in fact appears in the final paragraph of the essay and gives little indication about how Bertalanffy understood the term (Bertalanffy). Two understandings of mathesis universalis are "a general theory of quantities or proportions" or the "mathematization of method" (Mittelstrass 593). Neither seems to quite match the description Bertalanffy gives of General Systems Theory as a mathematical project. Bertalanffy establishes the axiomatic nature of this "logico-mathematical field" by envisioning the generation of "propositions expressing system properties and principles" from "the notion of 'system' and a suitable set of axioms" (Bertalanffy 55). Bertalanffy assigned it the central task of "formulat[ing] and deriv[ing] […] those general principles that are applicable to 'systems' in general" (Bertalanffy 411). These characteristics amount to a formal system, summarized in lay terms as "a collection of rules for churning out an endless series of mathematical truths solely by mechanical symbol-shunting without any regard to meanings or ideas hidden in the shapes being manipulated" (Hofstadter 3). Disregarding such meanings or ideas, in turn, purchases the rigor and exactness that only mathematics enjoys and which General Systems Theorists clearly appreciated. Thus, in view of the mathematical dimensions of the project, General Systems Theory's claim to the status of mathesis universalis rests on its ambition to develop a rigorous, exact formal system of systems.

To the extent that Bertalanffy sought to build a *complete* formal system of systems worthy of being called a *mathesis universalis*, the epoch-making findings of Austrian logician Kurt Gödel ensured that such an achievement would never come to pass. In his Incompleteness Theorems,

Gödel proved that once a formal system had achieved a sufficient level of complexity, its completeness – which is to say its ability to derive all true mathematical statements, or, theorems becomes impossible. However, thesis five of Waelchli's Eleven Theses of General Systems Theory downplays, confoundingly, the implications of Gödel's findings for the systems language that Waelchli himself, Bertalanffy, Boulding and other early general system theorists imagined. Even as Waelchli admits that modeling nature by logico-mathematical means is "fundamentally flawed" and "structurally limited" by the "incompleteness of all languages," the systems approach gets around these problems by creating a metalanguage, which is to say, a language of a logically higher order language (6). What is left unspecified is what happens when paradoxes emerge at the meta-language level. The need to create a meta-meta systemic level to resolve the paradox at the meta level is analogous to the disturbing import of Gödel's findings. Yet there was no such thing, Gödel showed, as getting around incompleteness once a formal system attained a sufficient level of complexity. The seeming contradiction of Gödel's findings seen in Waelchli's fifth GST thesis raises disconcerting questions of what sort of language would GST's notion of the system have to be to qualify as a metalanguage.

Michel Foucault's thoughts on the seventeenth century mathesis helps to clarify the confusing relationship between mathesis and language that Waelchli's thesis inadvertently raises. For Foucault, a mathesis refers to a "universal science of measurement and order" and he considers it to be the "gravitational center" of Classical or Enlightenment thought (56). Despite the presence of 'math' in the term, the universal method connoted by the *mathesis* is "system of signs" that seeks to establish order based on identity and difference (Foucault 57). The clarification provided by defining the mathesis as a system of signs explains Foucault's point that "the relation of mathesis to a general science of order does not signify that knowledge is absorbed into

mathematics, or that the latter becomes the foundation for all possible knowledge" (Foucault 57). The system of signs of which a mathesis was comprised, Foucault indicates, was "pure function, a totality of mechanisms, a great autonomous play of signs" (80). The sole function of this totality was to represent, which is to say, represent "thought as thought represents itself" (Foucault 78). Signs and thought, in other words, are one in the same. It is perhaps a perverse extension of this same alleged relation between thought and signs that underlies Bertalanffy's confidence in General Systems Theory's logico-mathematical language to give the very conception of wholeness the "unambiguous and exact expression which is possible only in mathematical language" (Bertalanffy 143). It is the dream of submitting wholeness itself to an "exact language" of systems that perhaps explains how Waelchli can postulate system as the basic unit of a metalanguage that gets around the incompleteness of all other languages.

Moreover, Bertalanffy's twentieth-century resurrection of the mathesis universalis attempts something akin to what Foucault flatly denies for the seventeenth-century mathesis, namely, an absorption of all knowledge into mathematics. Consistent with this sense of knowledge absorption, Boulding's contention that mathematics "studies all thinkable relationships abstracted from any concrete situation or body of empirical knowledge" betrays how the mathesis he was trying to help build substituted mere functionality for imagination about the world (197). So busy were early General Systems theorists trying to build a meta-level systems language on the strength of structural similarities between disciplines that they did not bother to question the picture of the world that that disciplinary structure presented.

Such an assessment of General Systems Theory is consistent with Sheldon Wolin's critique of the political science application of system theory in "Political Theory as a Vocation" (1969). As a whole, Wolin's essay challenges the preeminent concern with methods in the field of political

science. Decrying the impoverishment of a technique-oriented political science education, Wolin heads off one convenient assumption on which such educational models stake their validity, namely, that methods constitute a "kit" of ideologically neutral "tools" (1064). Wolin's thesis asserts the contrary, namely, that all tools incorporate philosophical presuppositions. In other words, theory *always* prefigures methods, such that only methodologies – tools to which theories are inextricably connected – exist. As such, 'theory-less method' is an impossible statement. One corollary for which this prefiguring allows is that theory seamlessly becomes a methodology as soon as it used to select or make decisions. As Wolin explains, the readiness "to acknowledge that facts depend upon some *criteria* of *selection* or significance" does not frequently translate into an acknowledgment that "such criteria usually turn out to be fragments of some almost-forgotten 'normative' or 'traditional' theory" (1073). Thus, theory and the criteria of selection or significance that constitute method are inextricable.

Another way to understand this inextricableness is to appreciate how methods present their own pictures of reality. When Wolin asks, "what must the world be like for the methodist's knowledge to be possible?" (1069), he broaches the eminently serious question of how methods order the world or what picture of the world emerges from methods by their implicit guarantee that the research practices they entail will reveal truth about that world in the form of knowledge. Broaching the subject of how system theory orders the world, Wolin considers what was, at the time he wrote his article, recent textbook in his field: *A Systems Analysis of Political Life (1964).* The textbook's author, Wolin indicates, posits in another textbook formal regularities, or discoverable uniformities in political behavior, as one major assumption for the movement of political behavior. As such, formal regularities constitute the preference of the systems theorist and thus comprise the center of the system theorist's tool-box (1069). The decisive criticism Wolin

lodges at GST's political science application is that a systems approach does not merely exclude important elements of the political world by inadvertent means, as even the textbook's author admits, but that a systems approach "may require" their exclusion (1065). Because systems methodology seeks uniformities, the political world – according to the systems theorist –is, nay, must be *nothing but* uniformities.

Extending Wolin's critique of systems theory for understanding political life to General System Theory's ambition to build a meta-disciplinary mathesis forces the question of what picture of the world, nature or reality would emerge if General System Theory's ambition worked. The picture of the world that must be true in order for the iso- or homomorphic traces posited by General Systems Theory to produce new knowledge would at least rely to some extent on picture of the world given by the centuries-old disciplinary configuration that medical anthropologist Annemarie Mol describes and which also informs the Flexnerian enterprise:

> Since the nineteenth century the various branches of science (physics, chemistry, biology, psychology, sociology) have been understood as differing not primarily in method (as was earlier the case), but in their objects of study. These were given by nature. They hung together in reality and ontology was the branch of philosophy that made this coherence explicit – often using the image of the pyramid. Each object domain was like a layer in a pyramid of objects ordered from the small and relatively simple to the largest and most complex. And each science had the task of studying the entities in one such layer. Thus, at the bottom of the pyramid the smallest particles and the force fields between them formed the object domain of physics, and at the apex the complex social relations between groups of people were to be studied by sociology. One of the dreams that went with this ontological monism was that, in the end, full knowledge about behavior of the smallest particles would

> explain everything else. Physics would explain chemical laws; chemistry would predict what happens to living bodies; biology would be able to explain psychological makeup and social relations. (Mol 153)

General Systems Theory could not be said share the same convenient dream of a bottom-up explanatory 'cascade.' It does, however, rely on the same disciplinary structure and thus the pyramidal, which is to say, hierarchical picture of the universe that results from it to advance what is an even more convenient dream picture of common laws operating at all levels of the hierarchy. In this way, General Systems Theory requires the same thing of the entire world that, per Wolin's critique, systems theory required of political life: to be nothing but uniformities. In view of how Engel remarks on this very dimension of General Systems Theory, the convenience of this uniformity-across-levels-of-reality dream that may have convinced, or seduced, Engel into attaching General Systems Theory so strongly to his conception of holistic patient care. For indeed, knowledge of laws operating at a hierarchical reality would present numerous points of therapeutic intervention.

Yet this very picture of nature's hierarchical organization points to the explanation of why General Systems Theory could not deliver what Engel hoped it could. Leaving no doubt as to the prominence and importance of hierarchical organization for General Systems Theory, the second of Waelchli's GST theses is that "natural systems are hierarchically arranged; each system is composed of subsystem and contained within a supra-system" (Waelchli 5). These systems in turn exhibited the structural similarities between one another that GST sought to articulate as iso- and homomorphisms under the exact and unambiguous expressions of mathematics. One of the fundamental methodological challenges that such work presents is to define the boundaries distinguishing sub-system from system from supra-system. Departing from the pyramidal theory

on which the nineteenth century allegedly segmented the world into the disciplines, General Systems Theory denies that these levels of systems are given by nature. The second thesis makes it clear that "systems are not objective realities of nature; they are subjectively defined by human observers" (7). Yet General Systems Theory cannot dispense with objective givenness completely as its reliance on boundaries makes clear: "General Systems Theorists seem to agree that to qualify as a system any entity must have a boundary that allows the observer to distinguish, at least conceptually, the system from its environment" (Waelchli 7). Thus, the fundamental methodological challenge of defining the hierarchical organization of systems was to reconcile the givenness of a boundary with the necessity of the observer.

It is the perhaps the failure to properly appreciate, let alone solve this challenge that underlies Engel's characterization of GST in his 1977 article as the biopsychosocial model's "conceptual approach." The ambiguous term is perhaps an ambivalent confession on Engel's part that GST fell short of or at least had not yet reached the status of a viable biopsychosocial methodology. Indeed, no GST methodology could have existed without a way of defining systems and how they relate to one another in a hierarchical arrangement. Without a methodology, the crucial integrating research that the biopsychosocial model required could not proceed. As fellow psychiatrist McLaren describes it, "researchers who gather data from a variety of theoretically unrelated fields will not be able to test the basic assumptions which led them to collect just those data and not others. They may be able to detect associations but, critically, not errors in their own basic assumptions" (McLaren 91). GST was responsible for providing the methodology that would have had to, among other tasks, combine biological, psychological and sociological data.

As his observations show, McLaren shares in the concerns as methodological exclusion of fellow GST critic, Sheldon Wolin, but approaching the topic with respect to the biopsychosocial

model's interdisciplinarity leads him to emphasize another set of pitfalls. Where Wolin is concerned with gross *ontological* exclusions concomitant with the adoption of a theoretical framework that posits nothing but uniformities, McLaren is concerned with the possible *epistemological* exclusions ("not collecting some data") committed by *not* adopting a theoretical framework. The way out of this ontological-epistemological double bind arguably lies in what Wolin celebrates as the richness of theories. Only rich theories can produce the methodological tools that at once make useful epistemological exclusions (e.g. filter out noise) without excluding important ontological considerations. By attempting to find structural uniformities across levels defined by the so-called human "content disciplines" that had been in place for over a century, General Systems Theory ultimately declined to present novel theories about the human, nature or the universe. In the absence of a new story by which to not only reorganize the academic division of labor but also to understand the human, the holistic patient care Engel proposed in turn had little recourse but to practice the superficial methodology of disciplinary supplementation. The mere overlay of additional disciplinary layers on the biological registers the perpetual dissatisfaction with the story told by the ordering of disciplines on which GST's holistic mathesis relied. GST sacrificed the opportunity for novel theory-making upon assuming that the division of labor established by categorical disciplinarity adopted a suitable theory of the world.

To the extent that Engel added no additional theoretical considerations other than that given by GST, his biopsychosocial model would have represented the empirically testable form of General Systems Theory, had either come to fruition. The very fact that neither did owes to theoretical impoverishment. A successful biopsychosocial model would have represented proof of General System Theory, or conversely, the biopsychosocial model would have been the empirically testable status of General Systems Theory. McLaren argues as much in his criticism

of the biopsychosocial model. Looking to philosopher Daniel Dennett's notion of model qua experience generator that "act[s] rapidly to generate (an approximation of) the material consequences which flow from the application of a theory," McLaren argues that the biopsychosocial model cannot be called a model because it was not even testing a theory. Indeed, there was no theory in GST's meta-disciplinary mathesis for the Engel's model to test (88). Moreover, GST's mathesis lacked the theoretical richness to even generate new tools to bring a new conception of nature to testable status, had it been there in the first place. It is for this reason that McLaren, in his criticism of the biopsychosocial model, describes GST as "utterly banal" (89). General Systems Theory was no more or less than a mathematization of wholeness.

Due to its nascent status, it is next to impossible to determine the extent to which integral physiology mentioned by Integrative medicine practitioner Dr. Leonard Wisneski shares GST's ambitions for the mathematizing totalization of a meta-disciplinary mathesis. Wisneski's description of integral physiology that justifies at least a superficial comparison to General Systems Theory – that is, "a unified field theory for the health and wellbeing" – does not evoke the relationship between disciplinarity and mathematics in the same way that GST does. Instead, integral physiology evokes the segmentation of Eastern and Western healing traditions by proposing that it is the science that finally unifies them under a single theory of energy, energy being the common denominator between the mainstream theories of Western physics and the "subtle energy" of Eastern medicine. Without a disciplinary intervention that attempts the imaginative theorizing that Wolin emphasizes, it is hard to imagine a new story of the universe emerging from integrative physiology, thereby foreclosing the integration of Eastern and Western healing approaches proposed under integral physiology.

2.3.3 Narrative and schema-based medicine – Holistic Medical Pedagogy as Path-dependent Disciplinary Coordination

In *Making Medical Knowledge* (2015), Mariam Solomon declares "much of" narrative medicine to be "politically disengaged" (203). Solomon understands politics to mean "political structures, such as class," which can become "causal players in the health of patients" (203). She goes on to declare that "narrative medicine, with its insistence on individual narratives, often misses more general structures, including political dimensions. For example, if social class is not part of the patient's or physician's narrative, it is left out altogether" (203). Solomon's charge of political disengagement might come as a puzzling surprise given narrative medicine's professed commitment to achieving social justice in health care,[8] along with its sustained deployment of politically charged thought from the pens of Michel Foucault, Judith Butler, Jacques Derrida, and Gayatri Chakravorty Spivak, among many others. This charge perhaps more readily fits more with schema-based medicine's reliance on Aristotelianism, American pragmatism and various cognitive theories for its theoretical foundations, not to mention its seeming unwillingness to make political commitments of any sort. Whatever the extent to which narrative and schema-based medicine practice political disengagement in regard to overtly medical matters, there is little doubt that they refuse to mount any sort of political challenge to disciplinary structures.

That narrative and schema-based medicine would refuse to engage in disciplinary politics seems just as puzzling and even counter-intuitive as Solomon's claim, given how the two projects are themselves interdisciplinary efforts working to integrate rigorous narrative competence into medical practice. A picture of how advocating for interdisciplinarity and refusing to engage

[8] See (Charon et al. 8)

disciplinary politics could coexist nevertheless emerges through "Apologia for a Medical Truant" (2008), an essay by Edmund Pellegrino, one of the major early influences on medical or health humanities rubrics and a voice with whom both narrative and schema-based medicine acknowledge foundational ties. In his apologia, Pellegrino owns up to "transgressing the perimeters of [his] clinical expertise" and thereby becoming a so-called medical truant (Pellegrino xiii). The space for which he leaves medicine is philosophy, raising the question of whether Pellegrino's crime is not so much disciplinary truancy as disciplinary trespassing. Ultimately, however, the two are one in the same: if he is playing hooky from the medical profession as a medical truant, he is, coextensively, an unauthorized trespasser in whatever alternate disciplinary space he may find himself. In other words, the discipline he plays the truant for is immaterial: if he is not doing medicine, he is invariably trespassing.

In view of Pellegrino's overt concern with trespassing, it is hard to know whether to interpret his titular apologia in the rhetorical or the emotional sense: does Pellegrino's essay issue a formal statement of justification or own up to having done a bad thing? Officially, of course, it can only be the former, but absent the political will to at least examine disciplinary boundaries as boundaries, it would also function as the latter. In the midst of apologizing, however conceived, for trespassing into philosophy, Pellegrino points to such luminaries as Berlioz, Chekhov, Keats and Somerset Maugham so as to illustrate that the disciplinary range of medical truancy further extends across music, drama, poetry and *belles lettres*. Pellegrino defends the value of medical truants like himself and these figures by pointing the need for physicians to engage in critical reflection and the Hippocratic notion that good medical care extends beyond scientific competence.

For all his defense of the value of medical truancy to the clinical practice, to medicine, to healthcare and to the humanistic disciplines, however, Pellegrino in no way contests the perimeters or bounds themselves – those that, when crossed, become the fundamental basis for the serious and political charges of truancy or transgression. A charge of truancy is, among other things, a charge of fraudulence. The "medical truant" Pellegrino admits, "is often discredited on grounds that physicians are technicians not intellectuals" (xvi). The technician-intellectual distinction easily evokes the sort of difference of cognitive style that Biglan might say the applied-pure dimension distinguishes between. Though Pellegrino might in all likelihood find the cognitive styles along such lines distasteful, so long as he defends medical truancy, he all but submits to the very disciplinary frameworks allied to the technician-intellectual binary, those frameworks supplying the very basis of the truancy he defends.

Pellegrino's wrestling with medical truancy illuminates the frustrating paradox of attempting bold interdisciplinary initiatives that, by their very existence, seem to call into question conventional disciplinary structures but do nothing to actually contest those same structures. A promising explanation of this paradox can be found in path dependency, a central concern of a school of political science called new institutionalism that seeks to understand how institutions affect agency. According to the new institutionalists, accounting for path dependency is to consider how the logic of institutions constrain action in ways that political actors neither see nor plan for. Moreover, the new institutionalists suggest that even with awareness, there is little probability of reversal. For the notion of path dependency also posits a high cost of changing direction that renders mere knowledge of a need to change direction insufficient. In short, path dependency explains why seemingly innovative interdisciplinary ventures would do little to actually change disciplinary structures themselves. Forging new institutional structures, which is to say, getting off

a given disciplinary path, requires both a knowledge of the path, which can be invisible, as well as a robust commitment to answering for the high costs of doing so.

By broadening their definition of institution to include not only formal material structures (constitutions, parliaments, departments) but also norms and values, the new institutionalists also posit in path dependency a highly durable link between ideology and material organization (Lecours 9). This image of institution surfaces in cultural critic Jonathon Dollimore's critique of the basic premise that art acts as a humanizing force. When Dollimore observes that "our culture industry and our humanities education system still *depend* on premise," he invokes the very same broad understanding of institution posited by path dependency – that is, a combination of material structures ("humanities education system") and the norm of an ideology ("art is a humanizing force") (40 italics mine). While neither narrative nor schema-based medicine could be said to promote this premise verbatim or advocate for a particular humanities education system, they both do have ideas about who the human is alongside ideas about how the scientific and humanistic disciplines should relate to one another in medical practice. The interdependence of ideologies of the human and disciplinary structures would in turn constitute the sort of institution that constrains action necessary for the development of holistic medical pedagogy.

One indication of the stifling force exerted by the institutional union of disciplinary structures and ideologies of the human emerges in *Literature and the American College*, a 1905 treatise Irving Babbitt. As one of Edmund Pellegrino's explicit interlocuters, Babbitt is one among many thinkers constituting a woefully unacknowledged intellectual pre-history of the medical and health humanities in general and narrative and schema-based medicine in particular. More importantly, Babbitt would thus also stand as part of the path on which the latter are dependent. In *Literature and the American Colleg*e, Babbitt seeks to establish the necessity for the humanistic

tradition in higher education while outlining the dangers it faces. In one section, Babbitt identifies "encroachment of other disciplines into the humanities" as one such danger, emphasizing "the humanities need to be defended to-day against the encroachments of physical science, as they once needed to be against the encroachments of theology" (30). Babbitt strives to keep the human more than a function of material things and thus not "entirely subject to the methods that have won for science such triumph over phenomenal nature" (30). Babbitt's concern with things is informed by Ralph Waldo Emerson's dichotomy between law of thing and law of man, one pair of irreconcilable opposites that Emerson says man must move between in the quest for the spiritual fulfillment that Babbitt regards as the central task of humanism. It is the fear of entirely reducing the human to things and thereby extinguishing his ability to transcend material reality that Babbitt also decries the encroachment of anthropology into humanism:

> The president of a congress of anthropologists recently chose as a motto for his annual address the humanistic maxim: 'The proper study of mankind is man;' and no one, probably, was conscious of any incongruity. At this rate, we may soon see set up as a type of true humanist the Chicago professor who recently spent a year in collecting cats'-cradles in the Congo. (30)

Conveniently overlooking the etymology of anthropology, Babbitt chortles over the notion of an anthropologist fulfilling the role of a humanist. The humanist, Babbitt believes, elevates man beyond the law of things – his "cats'-cradles," so to speak – to ascertain the so-called law of man. Hence any discipline that studies things cannot be called humanistic. Babbitt's anxieties betray the possibility that the borders between disciplines, those that distinguish theology, the physical sciences, the social sciences and the humanities from one another, serve a particular understanding

of the human, namely, an understanding that posits laws for the human to discover and understand through the work of humanism.

The work of humanism, which firm disciplinary borders help secure, not only privileges but, according to Babbitt, relies on the relationship between art and universal truth. It is for this reason that Babbitt decries the rise of originality in modern art and speaks approvingly of past attempts to apply Aristotle's "profound" doctrine that "the final test of art is not its originality, but its truth to the universal" (219). Art's access to the universal in turn explains why Babbitt promotes literature more specifically as central to the work of humanism:

> In short, the most practical way of promoting humanism is to work for a revival of the lost art of reading. As a general rule, the humane man will be the one who has a memory richly stores with what is best in literature, which the sound sense perfectly expressed that is found only in the masters (244).

It is Babbitt's confident linking of humane to "what is best in literature" that constitutes the ideology of art as a humanizing force on which, in Dollimore's estimation, humanities education systems rely. Babbitt's comments about the boundaries that protect humanism from the encroachments of anthropology, natural science and even theology means that this ideology helps to lay nothing less than the disciplinary boundaries themselves.

Together, the observations of Dollimore and Babbitt on humanism and the humanities education system help pinpoint art as an important constituent of the path on which narrative and schema-based medicine may be dependent as they negotiate the relations between narrative and science in their holistic medical pedagogies. By seeking to introduce artistic accounts of illness, disease or the practice of medicine into medical pedagogy, medical professionalism and possibly even clinical decision-making, narrative and schema-based medicine not only codify a sort of

truancy into medical education, but also invariably stoke conversation over the position that scientific accounts of disease in those same pedagogical processes. To the extent that medical education takes the hardline biomedical position of biological or scientific accounts as the ultimate truth of disease, introducing narrative competence into medical pedagogy amounts to nothing less than negotiating the crucial relation between art, truth and education.

In his aesthetic theory, the philosopher Alain Badiou outlines three conserved relations of art, truth and education. He calls these configurations the didactic, the romantic and the classical schemas. Looking retrospectively, the twentieth century failed in Badiou's estimation to produce a novel relation, earning it the distinction of being at once "eclectic and conservative" [*conservateur et éclectique*] (Badiou 15). Instead, Badiou envisions the reproduction of three schemas to the point of saturation. Though Badiou does pair what he sees as the three singular thought systems of the twentieth century – Marxism, German hermeneutics and psychoanalysis – with the didactic, romantic and classical schemes, respectively, he does not explain how they endured. Badiou's pairing does not provide a satisfying historical, cultural, social and political reason for the perpetuation itself, if for no other reason than the pairing merely defers the question by begging the answer to why these three thought systems endured. With the linkage of ideology and material structures posited by path dependency, however, it becomes possible to imagine how the didactic, romantic and classical arrangements could have the staying power that Badiou hypothesizes.

Badiou articulates the three art-truth-education schemas by first setting aside the question of what the second of these parameters – truth – actually is, i.e. *ontological* questions and then drawing them along the lines of two *aesthetic* considerations: 1) singularity, the characteristic of whether art has access to truths unavailable to other forms of thought and 2) immanence, the

characteristic of whether the discovery of truth occurs through the workings of art itself. The combinations obtained by variously denying and affirming art's singularity and immanence generate the three relations of art, truth and education:

1) The first art-truth-education arrangement, the *didactic arrangement*, affirms art's singularity but denies its immanence. Art's pedagogical role of instilling courage in the face of truth gives it a singular relation to truth: only art can sufficiently rouse courage in the face of truth, but other realms of thought determine what truth is. The property of art is the charm of the effect of truth, which leads away from the careful work of deliberating about truth. As such, this charm is dangerous and thus under the strict surveillance of truth-determining procedures (4).
2) The *romantic scheme* is the complete inverse of the didactic: it affirms immanence but denies singularity. Though it asserts that art is the domain of absolute truth, the romantic schema nevertheless allows glimpses of that truth to circulate through other realms of thought. Art's absolute truth makes it the salvation of society and the source of revitalization, giving it the preeminent pedagogical role.
3) Finally, the *classical scheme* denies art both immanence and singularity, which amounts to declaring that truth and art have nothing to do with each other. Art performs public services that include but are not limited to therapy and entertainment. For this reason, art could never serve a proper educational role, which is to say, with truth.

As if to render a concrete, empirical picture of these three art-truth-education abstractions that Badiou articulates, narrative medicine perpetuates a *didactico-romantic* configuration whereas schema-based medicine perpetuates a *classical* configuration. In both configurations, there exists a negotiation of art, truth and education – a negotiation which the cooperative interdisciplinarity

of both projects invariably forces them to undertake – that proceeds under the auspices of a relation in which disciplinary structure and an ideology of the human are bound to one another. These relations of disciplinary structure and ideology constitute the institution on which narrative and schema-based medicine's disciplinary coordination is path dependent.

2.3.3.1 Narrative Medicine's didactico-romantic relation of art, truth and education

Narrative medicine's decision to distinguish narrative and scientific reasoning as "completely different kinds of reasoning" is the fundamental prerequisite for its perpetuation of didactico-romanticism (Solomon 179). The ever-shifting relations between these two types of reasoning, that narrative medicine generates the "mediating schema" [*schème médiateur*] that Badiou posits for didactico-romanticism (Badiou 8). Narrative medicine indeed makes distinctions between the universality of science and the irreducible particularity of narrative, stipulating that "what distinguishes narrative knowledge from universal or scientific knowledge is its ability to capture the singular, irreplicable, or incommensurable" (Charon, *Narrative Medicine* 45). Access to the incommensurable or irreducible in exchange for creating generalizable claims would in turn disqualify narrative from truth when truth is conceived as the universal. Disqualifying narrative from access to the universality of truth in turn amounts to a denial of art's immanence – one of the two hallmarks of didacticism.

Narrative's irreducible particularity instead constitutes a singular relation to truth – the other didactic hallmark. The role that narrative medicine envisions for art's incommensurability – or whatever disqualifies it from universal truth science enjoys – with respect to the truth of contingency reproduces the singular relation to truth posited by didacticism: "narrative practices enable the observer or the participant *to live in the face of* contingency without trying to eradicate

it" (Charon, *Narrative Medicine 50, italics mine*). While the task of actually determining that contingency is indeed the truth would only belong to truth-determining realms of thought – e.g. science, philosophy, mathematics – only narrative singularity makes it possible to live with contingency and not seek to eradicate that truth, or so didacticism would have it. It is the fact that narrative enables a living-with – but does not supply proof of – contingency that reproduces didacticism's affirmation of art's singularity. In so doing, narrative constitutes didacticism's singular function for art: courage in the face of truth.

And yet narrative medicine explicitly disputes the logic on which a didactic denial of immanence might rest. The assertion that "the creative acts of representation – in writing or telling or painting or composing – do not merely reflect something real but *create* something real" triggers the romantic affirmation of immanence (Charon, *Principles* 166). Immanence, under the romantic schema, posits art itself as having access to truth. Just as the romanticism grants non-artistic thinkers access to truth, albeit not absolute truth, so too are the practicing physicians who developed narrative medicine obviously obliged to create a pedagogical frame in which truth can circulate through science as well, a necessary provision for a successful collaboration with scientific medicine. The romantic framework's denial of art's singular relation to truth would allow narrative medicine to grant truth-determining capacities to both science *and* art.

Only art, however, contains revitalizing possibilities. Monica Greco extracts a revitalizing function for narrative in narrative medicine from a story that the founder of narrative medicine, Rita Charon, relates from her residency in which she felt hopeless in the face of a patient's declining state of health as well as the grief she felt from the patient's wife. For Charon, the experience recounted in her story eventually helped to occasion the revelation that there is no limit to what physicians can offer their patients. What Charon means is that with the sort of skills of

empathy, reflection and communication by narrative competence, the possibilities for what physicians can do for their patients become endless, even in the instances where biomedical interventions have run their course. Extrapolating further on the question of limitlessness, Greco writes that, "'There is no limit' here signals an acknowledgment, and an opening towards, indeterminacy" (26). Greco goes on to link indeterminacy to "a surplus of vital possibilities available to an organism" (28). To the extent that narrative medicine's program of systematic narrative study affords limitless care, which is to say, care made open to indeterminacy by the practice of narrative competence, it perpetuates the romantic discovery of vitalism in the immanent encounter with absolute truth.

Narrative medicine's didactico-romanticism is a way of bypassing crucial decisions about truth that the co-operative disciplinarity inevitably forces it to make. Faced with the decision of whether absolute truth is found in the removed austerity of the universal or in the urgent immediacy of the particular, didactico-romanticism is narrative medicine's way of saying truth is both, without reconciling such troubling gaps as those between the universal and particular itself, or between science and art, objectivity and subjectivity. To be sure, there is some attempt at such a reconciliation in narrative medicine, as in Charon's contention that "logicoscientific knowledge attempts to illuminate the universally true by *transcending* the particular; narrative knowledge attempts to illuminate the universally true by *revealing* the particular" (1898, italics mine). Thus, science-facilitated transcendence and narrative-facilitated revelation are narrative medicine's two means of apprehending the universally true, thus obliging the practitioner to vacillate incessantly between the two.

2.3.3.2 Schema-based medicine's classical relation of art, truth and education

In contrast to narrative medicine's ever vacillating didactico-romanticism, schema-based medicine perhaps reproduces a comparatively more settled classical scheme by adopting a definition of truth that houses both scientific and narrative knowledge comfortably. Relieved of any connection to *ontological truth* under the terms of its pragmatist foundations, art in turn provides a "public service" [*service publique*], which in schema-based medicine takes the form of facilitating recognition and effecting sensitization (Badiou 13). If schema-based medicine's stated goal is to construct frameworks that enable medical students and healthcare professionals to first recognize, extract and be sensitized to certain features of complex clinical situation, the Aristotelian unification of *katharsis* and tragedy would serve that goal.

Indeed, schema-based medicine finds in Aristotle's third definition of *katharsis* a recognition-facilitating function of tragedy: "tragic narratives allow the audience to recognize 'pitiable and fearful' incidents that are part and parcel of every person's life" (Schleifer and Vannatta 6, italics mine). In this way, tragedy "shares medicine's central concern with human suffering," a concern that is instrumental, or functional (259). Just as biomedicine does not take up the question of the truth of suffering and only seeks to instrumentally relieve it, so too the classical arrangement reproduced by schema-based medicine require that tragedy not reveal any universal law or truth about suffering. Tragedy only supports the recognition of suffering. Subsequently, the better and more efficiently that physicians recognize the depths of suffering, the more efficacious or more humanely they can apply the tools of biomedicine to relieve it. Thus, by virtue of its knowledge classifications and the adaptation of Aristotelian concepts, schema-based medicine confers art classical status, designating it an important functional enhancement of clinical

practice while ensuring that it can never question the efficacy of clinical practice or the claims of the science underlying it.

2.3.3.4 The human, according to didacticism, romanticism and classicism

Though Badiou does not specify them, each of the three art-truth-education schemas invariably advance philosophical claims about the human. If indeed narrative and schema-based medicine perpetuate the three relations, then it would be expected that the associated claims would surface in their work. Indeed, hints of these claims of the human appear almost as axioms in both narrative and schema-based medicine. The didactic schema's human-defining claim would be that the human is capable of courage in the face of truth but needs further cultivation. Along with recognizing the plights of patients and extending empathy towards those who suffer, the ability to join "honestly and *courageously* with patients in their struggles" is included among the list of "human capacities" that narrative medicine believes is required of physicians (Charon 3). To the extent that humans need supplementation in courage and narrative competence serves as this cultivation, narrative based medicine furthers the understanding of the human as needing courage.

If didacticism uses art to rectify a single human problem or trait, then romanticism ministers to an entire state of being. Indeed, the romantic schema invokes an eminently traditional human predicament: the state of needing salvation. Badiou gives this impression when, in his explication of the romantic schema, he makes a Christian analogy that likens philosophy to the "detached, impenetrable Father" [*le Père retiré et impénétrable*] and art to the "suffering Son who saves and redeems" [*le Fils souffrant qui sauve et relève*]. Philosophy, like God, is unknowable and utterly removed from human life. Art, on the other hand, is the 'Word made flesh,' the same absolute truth from on high, but in human form, so that it may be closer to human suffering. Art's

potential for Christ-like salvation manifests in narrative medicine as the desire to "join, with the patient, as a whole presence, deploying all one's human gifts of intuition, empathy and the ability to bear witness" (Charon 133). Just as the romantic schema posits God the philosopher appointing Christ the artist to join fully in the human experience for the purpose of teaching the totality of His Word, so too does narrative competence appoint its practitioner to a complete descent from the austere heights of clinical science for the enter wholly – holistically – into the plight of illness, both for the sake of the patient and the sake of physician. This descent by itself, not to mention whatever equivalent of crucifixion – scorn from colleagues or hospital administrators, patient skepticism to narrative techniques or the of self-discovery itself – of course demands the utmost courage. Hence the ingenuity of the didactico-romantic reconciliation of didactic and romantic schema's human claims:

The human-defining claim made by the classical schema sits at the intersection of emotion, imagination, empathy and action, positing something to the effect that the vicarious experience provided by tragedy-induced *katharsis* can favorably interact with the human's innate emotional nature to stimulate empathetic or otherwise virtuous behavior. An image of the human consistent with this emerges through schema-based medicine's complex theoretical framework, which consists of a combination of cognitive theory, evolutionary theory, schema theory and a host of other theories that have very explicit ideas about what basic capacities humans enjoy. Schema-based medicine in turn exploits these capacities to justify the sort of public service that classicism posits for art:

> There is neurophysiological evidence – the "mirror neurons" we mentioned (see Iacoboni 2009) – that most humans are built to respond to other people's pain and suffering and that reading stories that contain pain and suffering sensitizes readers, lowering the threshold for

> recognizing, and, if you will, experiencing empathy for that pain. (Schleifer and Vanatta 235)

The public service that schema-based medicine's classicism posits for art thus requires the existence of neurophysiologically-grounded emotional capacities. Without these capacities, the katharsis of tragic narratives have nothing on which to exert their influence over behavior.

Altogether, the human that emerges from narrative and schema-based medicine's perpetuation of didactico-romanticism and classicism is conditionally courageous, in need of salvation and programmed to emotionally react to others' pain. These constitute universal human traits that, under the proper circumstances, art narratives can cultivate among medical students and other healthcare, or so narrative and schema-based medicine would have it.

2.3.3.5: A Politically Disengaged Humanism

Though both narrative and schema-based medicine took the crucial step of attempting to cultivate a humanistic skill like narrative competence as crucial part of medical professionalism, something that Babbitt mentions could be considered an affront to humanism, neither wanted to imagine a radically different view of the human than his own. Babbitt, narrative medicine practitioners and schema-based medicine practitioners want a human who can be made humane by what is best in literature and art, even if they disagree on what traits count as the universally human and, by extension, as the basis of humane behavior. And just as Babbitt insists on firm disciplinary boundaries that protect the sacred work of humanism, so too do narrative medicine and schema-based medicine, by their respective perpetuations of didactico-romantic and classical relations of art, truth and education, posit relations between science and art allied to ideas about the human that serve their pedagogical agendas. Though neither narrative nor schema-based medicine

necessarily uphold these disciplinary arrangements on behalf of their beliefs about the human and humanism quite as explicitly as Babbitt, the path dependency to which their co-operative disciplinarity is subject has the same effect.

Perhaps the most crucial ideological aspect of shared humanism, which categorical disciplinary boundaries protect, is the insistence that the human be apolitical. Babbitt implies as much when he complains of the emphasis on originality in modern art, which, as a result of a concomitant "loss of standards," has the effect of "inbreeding personal and national peculiarities and getting farther and farther away from what is universally human" (220). National, which is to say, political peculiarities, do not belong to the list of universal human traits. Though narrative medicine and schema-based medicine do not speak of art and politics as Babbitt does, if they speak of the subject at all, and certainly celebrate the personal in art and narrative in a way that he does not, their humanism is just as politically disengaged as his. Schema-based medicine's authors reveal their allegiance to an apolitical universal human upon admitting that they find it "odd" that "the contestation of basic human similarities should have taken on such a political edge in the humanities in the recent years" (Schleifer and Vannatta 401). Such a response is entirely consistent with and expected of a humanism that sees universal human traits as beyond or above political matters.

The image of narrative medicine's politically insulated humanism begins in the what is perhaps the most politically charged essay associated with narrative medicine: "The Politics of Pedagogy: Cripping, Queering and Un-homing the Health Humanities" by Sayatani DasGaupta. In this essay, the sixth of those that comprise *The Principles and Practices of Narrative Medicine* (2017), DasGupta reflects on her experiences in teaching health humanities material and facilitating discussions about non-dominant identities. Recognizing the power and privilege

operating in even well-intentioned efforts like narrative medicine, DasGupta advocates for an ethos of humility. She proceeds to demonstrate her own humility in a candid reflection on the first course she ever taught in the health humanities, *Illness Narratives: Understanding the Experience of Illness,* admitting that she dropped the sub-title on the grounds that it seemed "particularly totalizing" (DasGupta 142).

Yet totalizing endures through the goal of the narrative medicine classroom she gives. In seeking to unify "subjectivity and objectivity, the abstract and the concrete, the real and the imagined, disciplined and transdisciplinary, everyday life and unending history" (Soja 5, quoted in DasGupta 51), the narrative medicine classroom reproduces the coming-together of traditionally hostile categories that is the defining feature of German philologist Ernst Robert Curtius' definition of *total* humanism. Along with Babbitt, Curtius ranks among the influences on Pellegrino, author of "Apologia for a Medical Truant" and an acknowledged influence on narrative and schema-based medicine. Curtius' total humanism ambition to be "sensual and spiritual, philological and touched by the muses, philosophical and artistic, pious and political, all in one" (Englehardt and Jotterand 4-5). When viewed together, the narrative medicine classroom cannot help but assume all of the unwanted baggage of Curtius' total humanism. Though unifications may be desired and even warranted, there is not enough attention paid to the risk of totalitarian or totalizing oneness that such unifications pose.

Yet despite the declared ambition to unify such intractable oppositions, narrative medicine declines to do so on behalf of emotion and its many hostile others – such as professionalism or fact – by promulgating the parallel chart. The parallel chart – perhaps one of narrative medicine's most celebrated original innovations – is where practitioners write their emotions. "If your patient dying of prostate cancer reminds you of your grandfather […] and each time you go into the patient's

room, you weep for your grandfather" Charon tells her students, "you cannot write that in the hospital chart. We will not let you. And yet is has to be written somewhere. You write it in the parallel chart" (156). Schema-based medicine speaks approvingly of the parallel chart, writing that it "encourages students and physicians to pursue the very *narrative organization and understanding of experience* that, as we argued in Part I, is part of our human cognitive and affective inheritance. Such encouragement, as Charon demonstrates, develops narrative knowledge" (Schleifer and Vannatta 279).

As long as the standard medical outline remains intact, however, even the most sophisticated narrative organization and understanding of experience will do little in the way of holistic patient care. Even as Charon wishes to cultivate a form of medical education and patient care that is sensitive to affect and escapes rote subservience to traditional doctor outline, she does not challenge the formal constraints of that outline that make subservience to it the most convenient and therefore, likely option in the first place. Confoundingly, she demonstrates awareness of these formal constraints:

> You will hear a doctor saying to a patient who has just disclosed the death of a parent, 'We'll get to that in Family History.' Because many health professionals are uncomfortable around emotion and uneasy when the medical interview is not crisply and evidently focused on the physical problem at hand, they structure the conversation as it unfolds by interrupting the patient and redirecting him or her to furnish only medically relevant information in the order dictated by the doctor's outline. (98)

After ascribing this interrupting and redirecting behavior to all doctors, particularly younger doctors, Charon rightly discourages such a straightforward running through the doctor's outline. Moreover, she ascribes the force behind the interferences and redirections that sustain this running

through may be the imperative not only to enter the data but also discomfort with emotion. However, Charon creates a false dichotomy when she opposes discomfort with emotion against data-collecting along the lines of the medical interview categories. By virtue of the outline's structure, bypassing a patient's emotion and doing a proper medical interview is the *same* action, "medically relevant" standing for admissible evidence. Emotion does not, per biomedical assumptions, constitute admissible evidence and the categories by which the basic medical interview is structured to uphold that standard. Increasing physician awareness of their or other patient's emotions through narrative knowledge or writing in parallel charts thus will not only mean little to physician-patient interactions but the divorce of emotion from the work by the parallel chart upholds it.

Thus, the ambition for opposition-unifying total humanism does not extend to where it could perhaps make the most impact. Instead, the opposites between emotion and fact, affect and professionalism endure with the parallel chart and the unchanged official structure of the medical interview. The parallel chart perpetuates the sort of politically insulated humanism that extends at least as far back as Babbitt's writings on the role of literature at the beginning of the twentieth century, the isolation being a function of strict disciplinary boundaries that preserve, among other things, the apolitical view of the human around which such humanism revolved. This combination of ideology and disciplinary boundaries comprises the institution on which narrative and schema-based medicine's holistic medical pedagogy is path dependent and by which it is thus constrained. The constraints of path dependency are formidable enough to dissuade even the most politically astute and active endeavors, let alone those with ideologies that actively resist political awareness in the first place. Ultimately, changing disciplinary boundaries would threaten the apolitical human

on which narrative and schema-based medicine rely, leaving them little recourse but to mediate knowledge through such devices as narrative competence or narrative-derived schemas.

2.4 SUGGESTIONS FOR DISCIPLINARY INTERVENTIONS

Together, the critiques of the biopsychosocial model, integrative medicine, General System Theory, integral physiology, narrative medicine and schema-based medicine reveal six disciplinary habits that contribute to dissatisfying, un-disciplined holistic healthcare. These six habits furnish six areas for disciplinary intervention in the ongoing pursuit of more satisfying, disciplined holistic healthcare:

1) **Overlooking institutional constraints:** Insofar as relying on categorical disciplinary and its attending ideologies, including those determining nothing less than what nature and the human is, all the projects of holistic health care are constrained by path dependency. As formidable as these institutional forces are, they only constitute one among many with such hallowed, seemingly untouchable entities as the outline of a medical interview constituting additional institutional forces unto themselves. Narrative and schema-based medicine's unwillingness to engage these entities, even as they decry their impacts on patient care and address them through narrative knowledge-developing techniques like the parallel chart, constitutes perhaps the most devastating weakness of the apolitical humanism on which they are path dependent.
2) **Reliance on object givenness:** While General Systems Theory took a crucial step out of categorical disciplinarity by proposing that systems were not given by nature, they nevertheless relied on boundaries to conceptualize them. The puzzle of how to use

boundaries to create systems to study and between which to find isomorphic traces constituted perhaps GST's most debilitating methodological weakness. It is this same adherence to object givenness that perhaps figures in narrative and schema-based medicine's refusal to contest medical interview outlines.

3) **Lack of high impact theorizing:** The very endeavor of holistic healthcare challenges prevailing answers to big questions, including those pertaining to how the world works and who the human is. That it should make such a challenge comes as no surprise considering healthcare itself proceeds as answers to these questions, among others. Dissatisfied with biomedicine's answers to these questions and what sort of healthcare they helped form, Engel sought a "heretical" answer, but did not actually produce one. To be sure, he thought he found one in General Systems Theory, but with its sole ambition to identify structural similarities between the disciplines as they had long existed, it ultimately gave the same answers about the nature of the world and the human as the biomedical model. Finally, under narrative and schema-based medicine's negotiations of art, truth and education, the universally true human remains a being who is conditionally courageous, salvation-needing and made virtuous by innate emotional programming. Neither project of holistic medical pedagogy advanced new ideas about what the human is.

4) **Representationalist function for language:** General System Theory's twentieth-century meta-disciplinary mathesis relied on roughly the same understanding of language that Foucault posits for the seventeenth-century mathesis, namely, as a totality of signs that can "represent thought as thought represents itself" (78). Many challenges have since been advanced against this view of language. Though narrative and schema-based medicine could be said to recognize the challenges raised against this view, the apolitical humanism

that both perpetuate would diminish the possibility for taking the politically controversial, steps of developing a pedagogical framework that does not rely on representationalism.

5) **Oscillation between totalization and fragmentary accumulation:** Under categorical disciplinarity, holism is only achievable via the surrogates of fragmentation and totalization. The disciplinary supplementation of the biopsychosocial model and integrative medicine constitute the fragmentation surrogate insofar as they put multiple facets of *what* constitutes health together without advancing new ideas about *how* they go together. Both rely on the holistic research operations to which they are allied to do this work. General System Theory's meta-disciplinary mathesis attempts to relate disciplinary findings together under a view of the universe as one wherein different levels of reality share isomorphic traces of one another, amounting to something of a mathematizing totalization. Finally, narrative medicine's attempt to unify traditionally hostile categories resurrects the notion of a total humanism lurking in its complex intellectual lineage.

6) **Superficial reconstitutions of categorical disciplinarity:** Though confronting the limitations of disciplinary boundaries head on, all of the holistic projects only superficially reconstitute or even question disciplinary categories. Perhaps the most immediately obvious manifestation of this reconstitution is the title of Engel's attempt at holistic patient care: the bio-psycho-social model. General Systems Theory and integral physiology also invoke, without actually doing much to change, categorical disciplinary in their holistic research operations, the former invoking the familiar disciplinary segmentations of reality, the latter invoking Eastern and Western healing traditions. Narrative medicine mediates the divide between art and science by merely asserting the former as revealing the particular and the latter as transcending the particular. Finally, schema-based medicine's three

categories of knowledge informed by American pragmatism – nomological sciences, human sciences and functional knowledge – could be said to outfit the natural sciences, social sciences and humanities with different names. Together, these projects paint a picture of the many decades-long search for holistic healthcare as a wrestling with disciplinarity that only goes so far.

CHAPTER 3: A FORMALIST DISCIPLINARY INTERVENTION

3.1 INTRODUCTION

The previous chapter's critique of the biopsychosocial model, Integrative Medicine, General Systems Theory, integrative physiology, narrative medicine and schema-based medicine should leave little doubt as to the necessity of making a disciplinary intervention to achieve holistic healthcare. This chapter seeks to answer the crucial question of how to actually achieve it. Each challenge uncovered by the critiques of the six attempts at holistic healthcare corresponds to a target that a disciplinary intervention would need to hit. Although tempting to match each target to its own discipline-specific solution, the endeavor of which these disciplinary interventions work on behalf – holistic healthcare – would call for a single integrated approach to dealing with all of them. To that end, this chapter seeks to develop that one approach, and it hinges on the broadest possible deployment of formalist reasoning. The promise of any sort of formalism to achieve this feat lies in the disciplinary ubiquity of form itself: "in disciplinary terms, form can point us to visual art, music and literature, but it belongs equally to philosophy, law, mathematics, military science, and crystallography" (Levine 2). The reach of form becomes even wider when taken to mean "an arrangement of elements – an ordering, patterning or shaping" (3). It is this broadest possible understanding of form that defines the formalism on which the disciplinary intervention attempted in chapter four is grounded.

This broadened formalism synthesizes the work of four theorists: Caroline Levine, Annemarie Mol, Karen Barad, and Elizabeth Grosz. With the exception of Levine, none of the other theorists would self-identity as formalists. Nevertheless, the ideas each puts forth reinforce

one another to such an extent that they could be said to amount collectively to a radical, yet productive formalism that could animate a disciplinary intervention on behalf of holistic healthcare. To show how, the four sections of this chapter correspond to a discussion of the key formalist idea of each major theorist: nesting, enactment, intra-action and torsion. Each section has three components, consisting of: 1) a description of how each theorist does essentially qualify as formalist through an explication of the corresponding key formalist idea; 2) an explanation of how the theorist's formalism intersects with the challenges identified in chapter two; and, finally 3) which aspects of the disciplinary intervention the key formalist idea helps to justify methodologically. Altogether, these sections begin to demonstrate the full capability of broad understandings of form to do the disciplinary work that truly holistic healthcare would require.

3.2 NESTING

Caroline Levine posits in *Forms: Whole, Rhythm, Hierarchy, Network* (2015) a new formalism that casts both politics, broadly conceived as social arrangements, and art as functions of form and, hence, of one another. As such, politics and aesthetics are "*nested inside* one another" such that "each is capable of disturbing the other's organizing power" (16-17; emphasis added). Positing form as having both political and aesthetic dimensions in turn "dissolves" the "traditionally troubling gap between the form of the literary text and its content and context" (Levine 2). While it is hardly a stretch – indeed, it is eminently fitting – to think of aesthetics in formal terms, doing so with politics is a harder sell. Levine develops a formalist account of politics from three thinkers: Roberto Mangabeira Unger (1947-), Michel Foucault (1926 - 1984), and Jacques Rancière (1940 -). Unger, a legal theorist, promotes an understanding of politics that rejects any overarching deep

causal structures, preferring a vision of political systems as a patchwork affair lacking any sort of overarching coherence. Unger's political world is one where forms sometimes reinforce or cancel out one another, but always collide. Unger's vision contrasts with that of Michel Foucault who argues in *Discipline and Punish* (1975) for a central organization that recruits forms from diverse sources to impose order. Though Levine appreciates Foucault's attention to the intricacies and unexpected developments of this formal recruitment, she reaches the opposite conclusion about it, namely, that it results not in a centralized order but rather in the patchwork, highly disorganized vision that Unger favors. Finally, Levine looks to Rancière's reading of Rosa Parks in his *Hatred of Democracy* (2005) to envision political action as nothing more or less than formal rearrangement.

In total, Levine's formalism presents nothing less than a picture of reality as a single plane on which any given form can travel, perform contradictory functions and interact with other forms. The term recruited to talk about the complex behavior of forms on a single plane is affordance. Borrowing affordance from design theory, where the term is used to describe the "potential uses or actions latent in materials and designs," Levine defines it for formalist purposes as "the limited range of potentialities" to which a form lays claim. These ranges can reroute, reinforce or contradict one another. One of the affordances Levine claims for fictional works is the rendering of theory. While acknowledging, the seeming "pervers[ity]" of discovering theory in fiction, Levine nevertheless makes an etymological justification for the proposition by pointing out that the Greek word *theoria* connotes a "looking at," "spectacle," or "contemplation" (134). Such an understanding of *theoria* in relation to fictional works becomes even more plausible when considered alongside the phenomenon of nesting political forms. The nesting creates the theory-rendering spectacle.

A comparison of two works of drama shows how. Arthur Schnitzler's *Professor Bernhardi* (1912) and Henrik Ibsen's *An Enemy of the People* (1883) may be said to nest political forms that collide with the forms of medicine practiced by the respective protagonists. In so doing, they render theories about the inherently political nature of medical practice. In the case of *Professor Bernhardi*, a play both published and set in early twentieth-century Vienna, the nested political form is the distribution of duties between two institutions: the hospital and the Catholic church. This distribution appears in the first act of Schnitzler's play when the titular Professor Bernhardi cares for a young woman with a case of septicemia, the result, the doctors confirm, of "an illegal procedure" (Schnitzler 293). The infection has advanced too far to be cleared up and the woman faces certain death. Surprisingly, Dr. Bernhardi notes she is in a state of euphoria, supposing herself cured. To protect her cheerful mood on the brink of her imminent death, Professor Bernhardi intervenes when a priest comes to administer last rights, asserting that because she does not expect to die, the sight of a clergyman would induce needless panic. To Bernhardi's professed duty of "ensur[ing] that as a far as possible [his] patients are allowed to die happily," the priest counters with, "we probably mean quite different things by [die happily], Professor" (307). Where Bernhardi sees dying happily as a panic-free death, the priest grounds a happy death in the knowledge of absolution from sin, which, in the woman's case, she has incurred from her abortion.

The two definitions of dying happy are formally incompatible. For the priest, this incompatibility poses no issues as the two conflicting forms exist in separate realms: medicine, he reasons, has jurisdiction over life, the church has jurisdiction over the after-life. Indeed, having offered to withdraw *only* in the event the young woman could still be cured, the priest establishes that presiding over death is a duty that does *not* fall under a physician's professional jurisdiction, in which case the Catholic Church's understanding of "dying happily" would supersede

Bernhardi's. Both priest and physician remain firm in their convictions, but ultimately Bernhardi is overruled and the young woman dies the panicked death Bernhardi hoped to spare her. The instance of Bernhardi, a Jew, interfering with the sacred rites of the official religion of the state is compounded by the fact that the patient's death resulted from a procedure outlawed by that religion. Bernhardi's actions set off a firestorm of scandal that first removes him from his post as head of the hospital and culminates with the humiliation of a public trial and, finally, imprisonment. In the fulfillment of what he understands as his professional duties, Bernhardi becomes nothing less than a political prisoner.

The most prominent political forms nested in Ibsen's 1883 play *An Enemy of the People* include the board of the municipal baths of a small, northern Norwegian village as well as the spatial relations generated by the bath's geographic location in the town. Though there is perhaps little doubt about the political nature of the former, the political nature of the latter might be harder to grasp. With an understanding of political struggles that includes "ongoing contests over the proper places for bodies, goods, and capacities," the physical placement of the baths is entirely political (Levine 3). In the play, the bath is located near a tannery, making the former vulnerable to the toxic waste produced by the latter. As a question of arrangement, it is also, of course, inherently formal. The bath's physical location sets off a collision between the board of the municipal baths and the play's protagonist and the baths' staff physician, Dr. Tomas Stockmann, who identifies bacterial contamination in the waters, the result of toxic waste from the tannery. Dr. Stockmann approaches the board with his findings, only to be coerced into suppressing them by its managerial front, his brother, the mayor, Peter Stockmann. Peter urges his brother to suppress it on the grounds that the bad publicity would sink the baths. Moreover, the cost to re-lay the water system would be so prohibitively expensive as to destroy the town's fragile economic upswing.

Unmoved, Dr. Stockmann persists in his campaign, only to find his former allies in the press and in various other town institutions vanish. At the explosive public meeting that comprises the fourth act, the townspeople vote unanimously in favor of a motion to identify Dr. Stockmann as the enemy of the people for his efforts to stem a public health catastrophe.

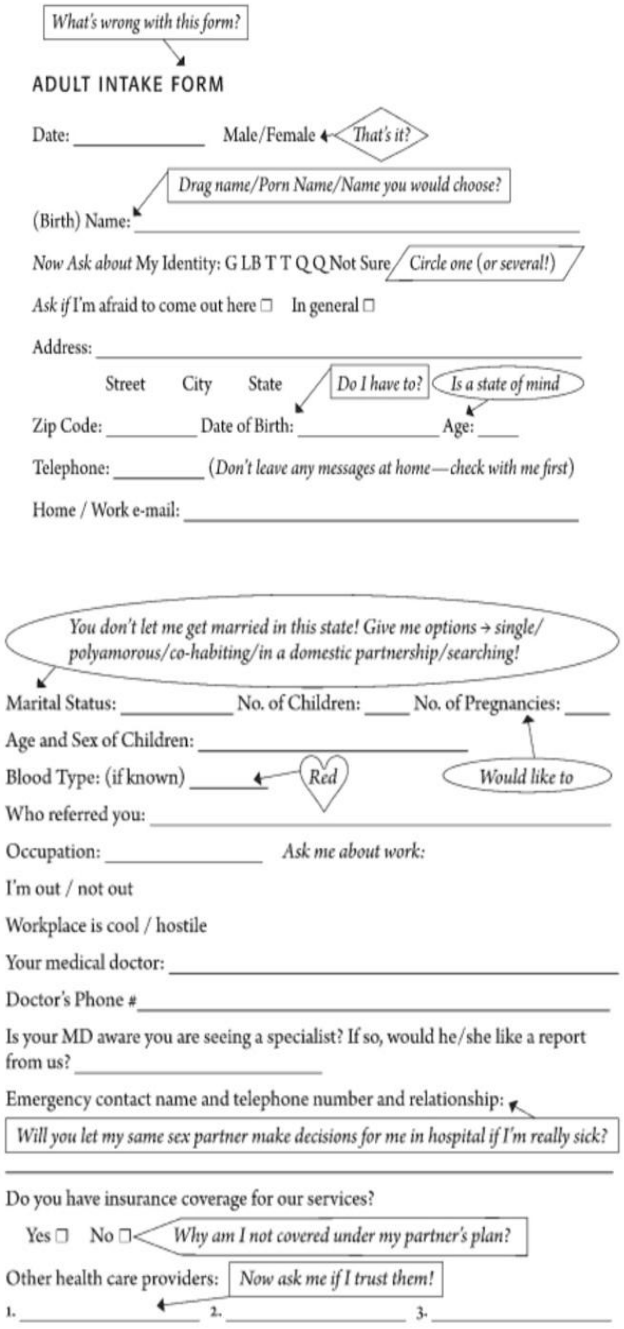
By their nesting of political forms, both *Enemy* and *Bernhardi* theorize the steep political consequences of fulfilling two duties that fall outside a strictly biomedical understanding of medicine: assuring a happy or peaceful death and advocating for hygienic infrastructure. In so doing, both plays may be said to disturb the biomedical, or any ideology of the medical profession for that matter, that would deny the necessity or even the presence of political action or social justice work in medicine. To the contrary, a medicine that would include, at the very minimum, these two duties would already be inescapably and inherently political. Such is the theory that the plays' respective nesting of political forms can be said to put forth.

The role of imaginative works can play in theorizing in turn intersects with one of the major challenges identified in the previous chapter: lack of high impact theorizing. General Systems Theory registers perhaps the strongest indicator of this lack by having declined to imagine a new vision of reality than that laid out by reality's segmentation into the conventional disciplines. Sheldon Wolin, alongside his critique of systems thinking for understanding political life, emphasizes the crucial role that imagination plays in theorizing. This role is a function of the multiple interpretations that facts can admit. "[For] [n]othing," Wolin stresses, "is more necessary as a condition of theorizing than that facts not be univocal. If they were, creativity and imagination would play a small role and it would be appropriate to speak of theorizing as a banal activity, as 'theory-construction.'" (1073). Wolin's emphasis on the creativity of theorizing would seem not only to not only justify the role that imaginative works play in theorizing but also to confirm why

nesting in a literary text is so important to that theorizing. The nesting of seemingly brute facts like social arrangements reveals their polyvocality.

It is for this reason that in the pursuit of theoretical understanding of disciplinary fragmentation in the Flexnerian enterprise, Chapter Four considers *Arrowsmith* – Sinclair Lewis' 1926 novel about the enterprise – alongside the forms that govern the three arms of the Flexnerian enterprise. Just as *Professor Bernhardi* and *Enemy* respectively nest a distribution of duties and geographic location of a municipal bath, so does *Arrowsmith* nest numerous forms, including the bureaucratic written forms of the Flexnerian enterprise. Their nesting in *Arrowsmith* helps to release their polyvocality, which in turn makes it less plausible to distinguish them from aesthetic forms, the polyvocality of which has long been celebrated. Regarding bureaucratic forms and aesthetic forms as differently the same is no doubt disorienting. Nevertheless, Levine points out that the bureaucratic form "haunts – and is haunted by – its aesthetic other" (98). One possible corollary of this mutual haunting is that bureaucratic forms would deserve the same critical scrutiny as that reserved for the aesthetic forms of a novel or poem. Allan Peterkin's critique of a medical intake form in *A Health Humanities Reader* (2014) given in Figure 5 gives an impression of what might said about one of medicine's many bureaucratic forms and how it might be critiqued. The form is critiqued from the perspective of a prospective patient who belongs to the LGBT community.

Figure 5: Critique of adult-intake iorms from chapter 19, "Adult Intake Form" of Health Humanities Reader (2016)



What's wrong with this form?

ADULT INTAKE FORM

Date: _____ Male/Female *That's it?*

Drag name/Porn Name/Name you would choose?

(Birth) Name: _____

Now Ask about My Identity: G LB T T Q Q Not Sure *Circle one (or several!)*

Ask if I'm afraid to come out here ☐ In general ☐

Address: _____

Street City State *Do I have to?* *Is a state of mind*

Zip Code: _____ Date of Birth: _____ Age: ____

Telephone: _____ (*Don't leave any messages at home—check with me first*)

Home / Work e-mail: _____

You don't let me get married in this state! Give me options → single/ polyamorous/co-habiting/in a domestic partnership/searching!

Marital Status: _____ No. of Children: ____ No. of Pregnancies: ____

Age and Sex of Children: _____

Blood Type: (if known) _____ *Red* *Would like to*

Who referred you: _____

Occupation: _____ *Ask me about work:*

I'm out / not out

Workplace is cool / hostile

Your medical doctor: _____

Doctor's Phone # _____

Is your MD aware you are seeing a specialist? If so, would he/she like a report from us? _____

Emergency contact name and telephone number and relationship:

Will you let my same sex partner make decisions for me in hospital if I'm really sick?

_____

Do you have insurance coverage for our services?

Yes ☐ No ☐ *Why am I not covered under my partner's plan?*

Other health care providers: *Now ask me if I trust them!*

1. _____ 2. _____ 3. _____

While the criticism of this fabricated intake form verges on the silly by identifying their blood type as "red" and by suggesting that patients be given the option to use their "drag name" or "porn name," other aspects of it point about the very serious political theorizing that the forms

accomplish. The form makes both positive discriminatory assumptions (marital status and the corresponding legal issues such as insurance coverage and medical power of attorney) and equally hurtful negative omissions related to identity and comfort with revealing that identity to a medical practitioner. The positive insertion of questions about identity and the coming out process makes these parts – the form's negative space – visible. In total, the forms theorize about gender politics even as they perform the perfunctory functions that justified their creation. The Flexnerian forms likewise theorize about discipline, which is to say, the categories of applied and pure, hard and soft, life and nonlife, even as they perform their respective functions. Their theorizing about discipline only goes far, however, justifying the need for the theorizing that *Arrowsmith* accomplishes by nesting them.

3.3 ENACTMENT

Annemarie Mol's *The Body Multiple* (2002) is an ethnography made uncommon by what it seeks to observe: atherosclerosis. Where ethnographies have traditionally examined groups of people, *Body Multiple* shifts attention away from people to a common disease. People do not disappear, however, and in fact they figure more prominently than might be expected in the ethnography's answer to the deceptively simple central question it raises: what *is* atherosclerosis? To arrive at an answer, *Body Multiple* alternates between research spaces and patient care spaces, traversing between the exam room, the operating room and the pathology laboratory, among others. In the exam room, atherosclerosis is the recounting of pain while walking or, more generally, its interruption of any daily activity. In the laboratory, however, atherosclerosis appears to be something markedly different. Since there are no patients to be found in the laboratory,

atherosclerosis cannot be what it is in the exam room. Instead, it is the image of a thickened vascular intimas under the microscope. Yet despite their stark differences, both are a function of various practices. It is in tracing these practices that Mol's uncommon ethnography of a common disease is more properly understood as a praxiography.

The sense of practice evoked in the altered root – *praxia* – must be distinguished from clinical practice. Whereas clinical practice can refer but is not limited to assessing, diagnosing and prescribing, the *praxia* in which Mol is interested veers more toward the meaning imparted by the original Greek, namely, a more general doing. It is a general notion of doing that leads to the conception of practice in formalist terms. If, as Levine indicates, affordance is what a form is "capable of doing," any *praxis* – which is to say, any doing – must, conversely, exist among the range of possibilities given to any given pattern or arrangement. Counter-intuitively, one such *praxis* is the disease at the center of Mol's ethnography: atherosclerosis. If Mol's ethnography seeks to study the practicalities of *doing* disease, which is to say, to *all* of the behaviors, statements, implements, spaces, timings and data that afford the disease, then disease can never stand alone as a discrete object or state. Against the biomedical picture of disease as a localizable, material somatic defect, atherosclerosis is instead an affordance of complex arrangements involving but in no way limited to physicians, blood pressure cuffs, arterial plaque, technicians, data, patients, complaints, exam rooms, microscopes, dyes, and glass slides. Mol's unbracketing of an ostensibly discrete element – the disease of atherosclerosis – only begins to reveal the complex arrangements – the form – of which that disease is an affordance. Considering disease as an affordance necessarily formalizes medical practice, which is to say, makes medical practice a question of form.

Out of this praxiographic, which is to say formal inquiry into atherosclerosis, arises a need for a term that relates the doings Mol seeks to describe and the ontological issues she wants to explore through these descriptions. In short, do these practices, say, perform or construct disease? Mol chooses neither, instead opting for enact. Rejecting "construct" on the grounds that its workshop connotation would clumsily confer a sense of assemblage on atherosclerosis, along with "perform" on the grounds that its theatrical connotation invokes a more real reality of atherosclerosis hiding backstage, Mol chooses "enact" because it "suggests that in the act, and only then and there, something *is*" (33). The etymology of enact, the combination of "in" and "act," supports Mol's deployment of it for her purposes. Bolstering her argument about enacting disease by gesturing to work on gender identity, Mol emphasizes the many things that, according to such work, require the practice of gender identity as well as how "the *pervasive* and the *mundane* acts *in* which [identity is practiced] make people what they are" (37 italics mine). Likewise, atherosclerosis, or any other disease for that matter, consists of many things and acts that together make the disease what it is. But while Mol's ethnography no doubt demonstrates the myriad of things involved in atherosclerosis, what is conspicuously missing from her praxiography are the pervasive and mundane bureaucratic forms that, for Levine, are haunted by an aesthetic other. This form-mediated governance would not emerge in Mol's ethnography that, by definition, strives to engage non-written documents any more than behaviors would figure in Levine's new formalism. Therefore, putting Mol and Levine together under the heading of a radical formalism helps to fill in the gaps missing in each.

Further bringing the two together, Mol situates what I suggest is her formalist idea of medical practice in a landscape akin to Levine's flat plane of formal *dis*organization when she cites Bruno Latour's idea of *chains of associations* – network-forming chains whose "coherence

is a material and practical matter, not a question of logic" (64). The text from which she adapts the term – Latour's *The Pasteurization of France* (1984) – describes how Pasteur's invention of the vaccine did not unilaterally impose itself on medical practitioners but rather spread through associations. Though farmers readily allied themselves to vaccination for the simple reason they had something to gain (vaccination protected livestock), doctors resisted it until a vaccine market was established and they could use vaccines in privacy. Latour's findings move Mol to conclude that science does not have the power to unilaterally impose itself on medicine. Actors outside the laboratory or other spaces in which scientific knowledge is produced, be they farmers or physicians, "do not get overwhelmed by a massive structure or a coherent episteme" (64). Rather, chains of associations take the place of these massive structures of coherent bodies of thought.

Considering the forms from all three arms of the Flexnerian enterprise attempts to understand the possible institutional constraints that bind the activities of research, medical education and patient care. Putting all of forms together also attempts to honor Mol's contention that "in practice, such diverse phenomena [as atherosclerotic plaque, blood or flesh, forms or conversations, work hours, or insurance schemes] do not belong to different orders. It makes no sense to delegate them to separate layers of reality" (155). Likewise, the three arms of the Flexnerian enterprise do not exist in layers: research is not the foundation of medical education, which is not the foundation of clinical practice. Instead, the three activities exist on a single plane on which their respective forms collide and reroute one another.

Where Mol conducted an ethnography on non-textual practices comprising the medical care and handling of a single disease, Chapter Four of this dissertation engages in a text-centered analysis that broadens out from patient care to include the institutionally interconnected activities of medical research and medical education. Where Mol does anthropology philosophically, the

disciplinary intervention of chapter four does literary analysis anthropologically and philosophically. The anthropological aspect of this work derives from the fact that the Flexnerian forms were culled primarily from my experiences in each of the three arms of the Flexnerian enterprise. My role as an MD/PhD student at the University of Illinois at Urbana-Champaign College of Medicine constitutes the experience in the medical education arm. My role as a clinic manager of a nearby medical facility, Avicenna Community Health Center, constitutes the experience in the patient care arm. Finally, my role as a participant in the undergraduate research fellowship offered by the University of Kansas Medical Center's Pharmacology and Toxicology department constitutes the experience in the research arm. The philosophical aspect derives from the work of considering the role of these forms in enacting disciplinary fragmentation throughout the Flexnerian enterprise.

3.4 INTRA-ACTION

Karen Barad develops her notion of intra-action on the basis of an important experiment in physics: the double-slit experiment. The experiment is attributed to both Thomas Young, who, in 1801, first performed the experiment on light under the theoretical assumptions of classical optics, as well as to Clinton Davisson and Lester Germer, whose adaption of the experiment for electrons helped establish the experiment as a bedrock of quantum physics. In both experiments, the basic physical phenomenon in question is diffraction. A standard physics definition identifies diffraction as the bending of waves as they pass through barriers. Many experiments in physics in fact deal with diffraction. What is notable about the double-slit experiment performed on electrons is that it establishes diffraction where, per the understanding of classical physics, it should not be. The

double-slit experiment indeed proves that electrons exhibit wave-like properties despite the longstanding classical assumption that they were particles. The double-slit experiment thus gives evidence for the wave-particle duality of electrons, a contradiction forbidden by classical physics. An equally disconcerting and interlocking revelation of the double slit-experiment is that the apparatuses of which it consists had a role in shaping the nature of the object – electrons – that it purported to study objectively.

One of the figures that first proposed this and other novel conceptions of the apparatuses of experimentation was Niels Bohr, the early twentieth-century physicist responsible for a quantum understanding of matter. Bohr practiced an inextricably linked physics-philosophy, that is, a rigorous philosophical understanding of the significant para- or meta-scientific implications of his physics research. In the course of his philosophy-physics, Bohr generated insights that counter-intuitively unseated the conceptual basis of scientific experimentation: "according to Bohr, *theoretical concepts* (e.g., "position" and "momentum") are not ideational in character but rather *are specific physical arrangements*" (Barad 814, italics in original). That is, the central importance of the experimental devices by which, say, position and momentum are measured does not allow for either to be pre-existing properties of objectives, which is to say, objective referents to which ideational concepts refer. In this way, Bohr's reflections confer a formal, perhaps even aesthetic character on a scientific process that, by the name given to it, already seems prepared to accept these characterizations. Indeed, experimental *design* signals nothing if not a very carefully considered, very strategically planned arrangement of elements. In the case of the double-slit experiment that Barad takes as emblematic of intra-action, the principal design element of the experiment – the grating – has a say in what form the experiment's object – light – will take. Far from light possessing pre-existing, determinate properties that would justify its characterization by

the equally pre-existing, determinate concept "wave," the double-slit experiment is instead an intra-action, a "mutual constitution of objects and agencies of observation" (Barad 197).

This mutual constitution bears significantly on one of the challenges with which General Systems Theory (GST) admits it had long wrestled: distinguishing or defining the object of its research, the system. In the second thesis from the eleven GST theses given by Waelchli, it is the human observer who conceptually distinguishes a system based on some boundary that allows it to be distinguished, at least conceptually, from its environment. The problem of distinguishing research objects from everything surrounding them is one of the oldest in all of scientific experimentation. Anne Fausto-Sterling evokes as much in her reflections on the difficulties of isolating the corpus callosum, a tract of the brain that is notoriously hard to distinguish from its surrounding brain structures. On the practice of creating isolatable, objects for scientific experimentation, Fausto-Sterling writes that "this challenge itself is nothing new. Pasteur had to bring his microbes into the laboratory before he could study them. Morgan had to domesticate the fruit fly before he could create modern Mendelian genetics" (Fausto-Sterling 121). The nature of this challenge raises a perennial, seemingly inescapable anxiety about the extent to which a system, a corpus callosum, a microbe or a fruit fly has a real existence in the world, or more precisely, whether their *discreteness* has a real existence.

The formalism of intra-action would say that this discreteness is only real upon its relation with an experimental apparatus or agency of observation. This view resonates with Mol's contention that "in practices objects are enacted" (32-33). With respect to the question of what an object is in its hypothetical state before the intra-actions of practice, the first key formalist term of this chapter – affordance – proves helpful. A hypothetical, pre-relational object is nothing more or less than the range of potentialities and latent possibilities specified under the term affordance.

This understanding of affordance helps to answer a crucial question raised by the forthcoming discussion of chapter four, namely, the question of how that chapter's objects – Flexnerian forms – afford disciplinary fragmentation. Disciplinary fragmentation can, as it were, only be one of many possibilities available to the Flexnerian forms. It can never be a fixed property of them. Chapter Four's discussion about them in relation to the Biglan categories only serves to elucidate disciplinary fragmentation as a latent possibility of these forms. It is the intra-action of the forms and the Biglan categories that produces evidence that disciplinary fragmentation figures among the Flexnerian form's affordances.

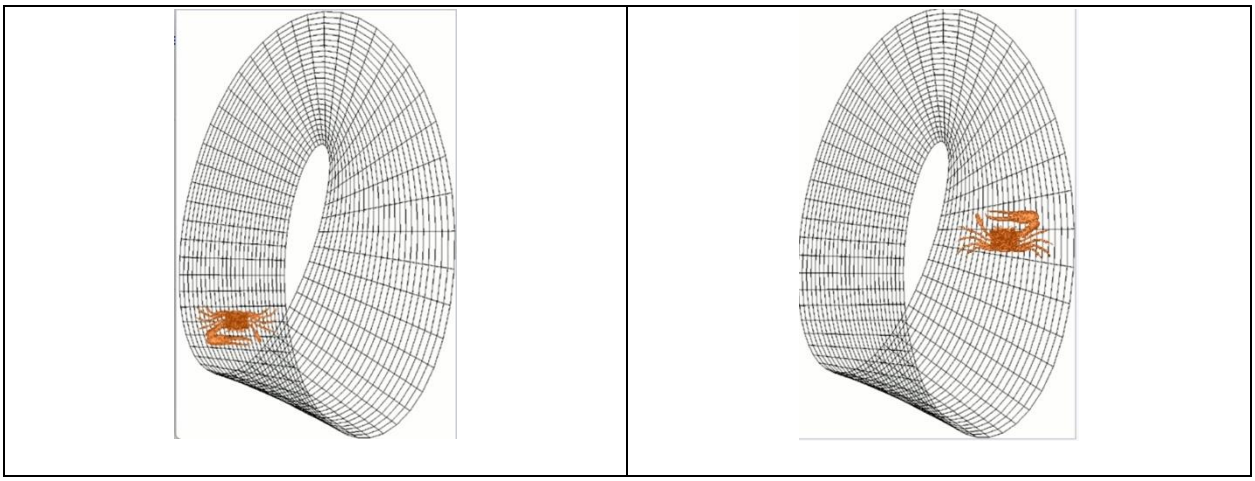
3.5 TORSION

The justification of Elizabeth Grosz as a formalist rests on the conceptual means by which she avoids dualism in her articulation of the relationship between mind and body in her 1994 *Volatile Bodies: Toward a Corporeal Feminism*. To pull off this feat, Grosz draws inspiration from an intriguing mathematical form called the Möbius strip (Figure 6).

Figure 6: The Möbius Strip by M.C. Escher

Discovered by German mathematician August Ferdinand Möbius in the mid-nineteenth century, the form that bears his name has many important geometrical properties, including one-sidedness when embedded in Euclidean three-dimensional space. The idea of a strip having not two but one side violates basic notions of inside and outside, or for that matter, front and back. Equally counter-intuitive, the Möbius strip has the property of being unorientable. Understood in the mathematical sense, orientability refers to the possibility of *consistently* constructing a perpendicular line at every point along the surface of a geometrical figure. Understood another way, the Möbius strip's non-orientability allows for a rotation of a two-dimensional image along its surface such that a complete cycle, which is to say, a full course along its surface, renders both the two-dimensional image and its non-superimposable mirror image, as Figure 7 illustrates:

Figure 7: The property of non-orientability as manifested by the rotation of an image along a Möbius Strip



Finally, the Möbius strip – a three-dimensional form – has the property of having only one boundary, such that the boundary is the topological equivalent of a two-dimensional form – a circle. That the Möbius strip inscribes a two-dimensional form in three-dimensional space no doubt constitutes a part of its deeply paradoxical implications.

Together, these three properties – a circular boundary, non-orientability and one-sidedness – have dissolving implications for back and front, inside and outside, image and non-superimposable mirror image. It is for this reason that the Möbius strip serves as a powerful, if startling conceptual tool to invert the primacy of mind over body in accounts of subjectivity. The strip, Grosz writes, indeed facilitates a "rethinking [of] the relations between the inside and outside of the subject, its psychical interior and its corporeal exterior, by showing not their fundamental identity or reducibility but the *torsion* of the one into the other, the passage, vector, or uncontrollable drift of the inside into the outside and the outside into the inside" (Grosz xii, italics mine). In one passage, Grosz invokes the Möbius strip in her description of what she calls double sensation. Indeed, the phenomenon of double sensation represents, for Grosz, a site where a Möbius-like mind-body torsion occurs. Defined as sensations "in which the subject utilizes one part of the body to touch another," double sensation occurs at cutaneous openings at the bodily surface (35). It is on the basis of the double sensation that these openings permit, Grosz speculates, that cutaneous openings figure "disproportionately" in Freud's psychosexual stages of maturation (35). Conceiving of maturation as the increasing recognition of a distinction between an external state and an internal state, orifices are the "pivot points" around which that distinction turns (36).

The torsion of the Möbius strip helps to resolve the troubling questions of how to relate a subject's internal knowing and object's external boundaries: subject and object are bound by the Möbius strip's torsion-like dynamic. It is this dynamic that perhaps underlies their mutual constitution. Moreover, the notion of torsion helps balance Mol's praxiographic account of knowledge: "the ethnographic study of practices does not search for knowledge *in* subjects who have it *in* their minds and may talk about it. Instead, it locates knowledge primarily in activities, events, buildings, instruments, procedures and so on" (Mol 32). Möbius-like torsion helps to

reconcile the externality that Mol posits for knowledge with the cognitive internality that the learning of knowledge implies. That is, torsion describes the manner by which external entities like activities, events, buildings, instruments and procedures interact with the ostensibly internal processes of mind to form knowledge. In this way, the patterns of the Flexnerian forms could be seen as mind-forming and thereby could be understood to afford the cognitive styles that Biglan postulated in his model.

CHAPTER 4: DISCIPLINARY FRAGMENTATION IN THE FLEXNERIAN ENTERPRISE

4.1 THE CONSOLIDATION OF BIGLAN COGNITIVE STYLES

In the effort to make an intervention in disciplinary politics on behalf of holistic healthcare, this chapter seeks to understand how disciplinary fragmentation might operate in the Flexnerian enterprise. If disciplinary fragmentation refers to the categorical separation of cognitive styles along the lines of the applied-pure, hard-soft and life-nonlife distinctions, then the various forms that govern the activities of research, patient care and medical education help consolidate this splitting in the Flexnerian enterprise. Suspending notions of deep causality, the three Biglan dimensions do not act on behalf of some all-encompassing, all-powerful structure that dictates the configuration of the forms and insidiously inserts fragmenting gaps into them. Rather the forms simply do the work of creating disciplinary fragmentation by manifesting patterns of the Biglan categories. Put another way, one of these forms' affordances – affordance being the range of capabilities to which a form lays claim – is fragmentation along Biglan lines.

To be sure, disciplinary fragmentation is not all that these nine basic forms do or afford. Written medical school exams, electronic medical records, peer-reviewed journals, medical school learning objectives, evidence hierarchies, medical textbooks, objective-structured clinical examinations (OSCEs), cultural competence materials and institutional review board (IRB) guidelines in fact afford a lot. Written exams *hierarchize* by distinguishing unlicensed student from licensed physician; electronic medical records *sort* by organizing vast quantities of personal

information into pre-fabricated categories; IRB guidelines *select* by determining what research projects proceed and which ones do not. Few would argue these affordances satisfy the purposes that the anonymous authors of these forms had in mind when they wrote them. Yet as the concept of affordance makes clear, a form is by no means limited to its intended uses as it possesses a range of capabilities, some of which are quite unexpected.

Like forms in the bureaucratic sense of the world – tax forms, immigration forms, registration forms – the set of nine Flexnerian forms discussed in chapter four are both pervasive and mundane. As such, they have traditionally existed as the opposites of the aesthetic forms encountered in novels, poetry, drama and other literary texts. Yet by furnishing a discussion that considers the pervasive and mundane forms governing the Flexnerian enterprise alongside Sinclair Lewis' *Arrowsmith*, a novel written just at the Flexnerian enterprise's completion in the 1920's, this chapter elucidates the mutual nesting of aesthetic forms, the binary forms of the Biglan oppositions and pervasive, mundane forms of the Flexnerian enterprise. The counterintuitive nature of mutual nesting is fully appreciated upon realizing that if *Arrowsmith* nests the Biglan categories as well as the pervasive and the mundane forms of the Flexnerian enterprise, then Flexnerian forms also nest what could be called the aesthetic.

The purposive deployment of language being a necessary precondition of aesthetic literary production, each mundane form's use of language to achieve certain purposes qualifies them for the critical interpretations traditionally reserved for literary texts. Though such interpretations of non-fictional texts might conventionally fall under the purview of rhetorical analysis, framing a discussion that moves between *Arrowsmith* and these Flexnerian forms as commentary that articulates mutual nesting rather than as some hybrid rhetorico-literary criticism helps dispel any essential difference between the texts while moving them toward a more recursive relation. In the

recursive domain, fiction and nonfiction, literary analysis and rhetorical analysis would not be distinguished by a categorical difference but rather exist together in a state of difference-in-sameness. It is in this recursive domain that the theoretical affordances of the Flexnerian forms and Arrowsmith can work together to elucidate something as elusive as disciplinary fragmentation in the Flexnerian enterprise.

4.2 CONSOLIDATING APPLIED-PURE COGNITIVE STYLES: WRITTEN MEDICAL SCHOOL EXAMINATIONS AND MNEMONICS, THE ELECTRONIC MEDICAL RECORD AND PEER-REVIEWED JOURNAL ARTICLES

The applied-pure dimension of the Biglan Model corresponds to the subject matter characteristic of use. Written medical examinations, electronic medical records and peer-reviewed journals exhibit their own patterns of use and thereby demonstrate the conserved yet changing nature of the corresponding Biglan distinction. In the case of written examinations, the applied-pure pattern manifests as the distinction between immediate clinical use and lifelong learning, a pattern that also carries over into the forms that become necessary for exam preparation: mnemonics. Similarly, the manifestation in Electronic Medical Records (EMR's) is the organization of information relevant to rendering a diagnosis versus information that could possibly only help render the diagnosis. Finally, peer-reviewed journal articles enact the Biglan distinction in deference to the exigencies of use-inspired basic research. Together, these forms help consolidate the splitting of applied and pure cognitive styles across the Flexnerian enterprise.

4.2:1 Written Medical School Examinations – The Applied-Pure in Medical Education

Written examinations are at once the most pervasive and consequential forms governing medical education, at least for medical students. Most of the exams a medical student will take are in-house, which is to say, written and developed by the faculty at their respective medical schools. All in-house exams may be regarded as cumulative preparation for the national, standardized licensing exams. Since the Flexnerian revolution of the early twentieth century, licensing exams have taken several forms, the most recent of which being the United States Medical Licensing Examination (USMLE). The USMLE is administered in three stages, known as Steps 1, 2, and 3 respectively. Adopted in 1992, the USMLE Step 1 replaced both the National Medical Board Examination (NMBE) Part I, "a battery of end-of-course examinations in seven basic science disciplines" (Swanson et al. 553) as well as the Federation Licensing Examination (FLEX), a three-day assessment of basic science, clinical science, and clinical competence first made available to states on a voluntary basis in June 1968 (Heywood 2). Upon the phase out of NBME Part I and FLEX in 1994, the USMLE became the sole avenue of licensure available to allopathic physicians.

Writing in September 1992 in anticipation of the imminent USMLE launch, a panel of expert USMLE writer-coordinators describes how it navigates the complex relationship between the board exams and medical school curricula. An illustration of the anxieties surrounding this relationship, one of the most common questions they receive revolves around whether licensing exams reflect what *is* taught versus what *should be* taught. The question is "awkward" insofar as the former would incur accusations of "preventing educational innovation"; the latter, accusations of "driving the curriculum" (554). Noting in 1992 that the dilemma raised by this question has "worsened over the past few years," the intervening decades since the USMLE launch have probably made consensus seem even more remote given the calls to integrate the knowledge of

non-scientific disciplines, including the social sciences and humanities, have only increased in both quantity and volume (554). That the dilemma was as awkward as it was in 1992 becomes all the more remarkable given the exam's scope was limited to the basic sciences. Indeed, basic science dominates the stated purpose of Step 1, which is to "assess whether an examinee understands and can apply key concepts of basic biomedical science, with an emphasis on principles and mechanisms of health, disease, and modes of therapy" (555). Encouraging "broad" interpretation of these words, the authors specify that the material assessed by Step 1 includes but may not be limited to topics with "immediate clinical application" as well as scientific concepts and principles "necessary for lifelong learning" (555). The authors justify the latter's importance by generally conceiving such knowledge as "long-term investments." Upon the distinction between questions that test concepts for the immediacy of clinical application and the remoteness of lifelong learning, the licensing exam enacts applied and pure cognitive styles

In order to appreciate the questions properly, a view of the scope and structure of the STEP 1 exam is necessary. The NBME furnishes such a view through a description of the exam, which is best visualized as a grid (see Table 2 below). The horizontal axis of this grid includes the following twelve organ systems: 1) immune system; 2) blood and lymphoreticular system; 3) behavioral health, nervous system, and special senses; 4) skin and subcutaneous tissue; 5) musculoskeletal system; 6) cardiovascular system; 7) respiratory system; 8) gastrointestinal system; 9) renal and urinary system; 10) pregnancy, childbirth, and the puerperium; 10) female reproductive and breast; 11) male reproductive and 12) the endocrine system. Joining the organ systems along the horizontal axis are 1) general principles of foundational science, 2) multisystem (i.e. multi-organ) disorders, 3) topics in biostatics and epidemiology/public health, and finally, 4) topics in the social sciences. The vertical axis relates to processes, including normal processes,

abnormal processes and principles of therapeutics, or the process of therapeutic interventions. The two axes cut across each other to render a complex network of scenarios students must navigate in order to pass the exam. Students must be prepared to answer questions related to the normal functioning, abnormal functioning and associated treatment for any of the thirteen organ systems of the body. They must also learn to see these processes, albeit to a much lesser extent, on the levels of the total person (multi-system), interpersonal or group interactions (social sciences), and entire populations (biostatistics and epidemiology). The grid generated by these two axes is populated with knowledge from both the traditionally defined disciplines and interdisciplinary areas that the NBME lists in its description of exam content. The traditionally defined disciplines include anatomy, behavioral sciences, biochemistry, biostatistics and epidemiology, microbiology, pathology, pharmacology and physiology whereas the "interdisciplinary areas" aging, genetics, immunology, molecular and cell biology, and nutrition.

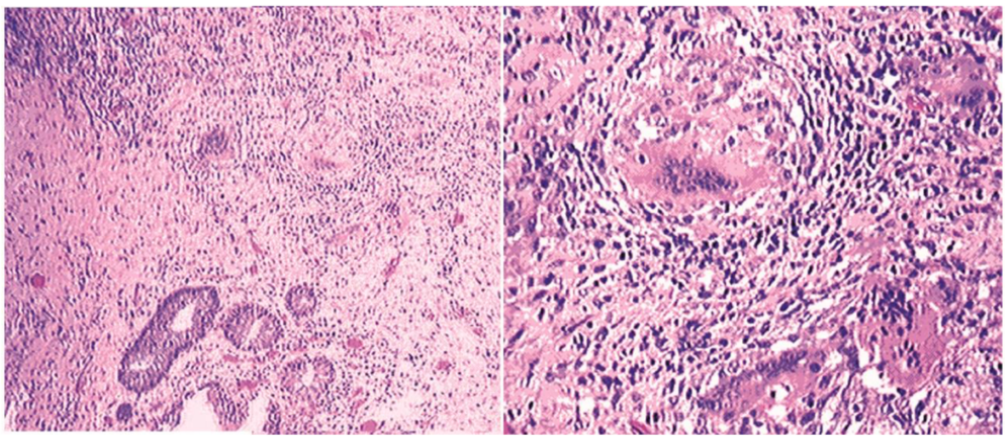
Table 2: Visual representation of STEP 1 content

Axis 2: Processes	Normal					
	Abnormal					
	Therapeutics					
		General Principles	Organ systems (x13)	Multi-system	Biostatics/ Epidemiology	Social sciences
		Axis 1: Levels				

Absent the direct look at an actual USMLE STEP 1 exam, which exam security prohibits, the sample questions released by the NBME to help medical students prepare for the real thing serve as a suitable surrogate to understand the form's patterns of use. The February 2018 booklet of sample questions features 117 multiple choice questions. Most of the questions consist of five

possible responses, but some will occasionally give six and others four. An example of a question that can be taken as one testing knowledge of immediate clinical application is given by Figure 8. The question tasks the student with rendering a diagnosis by synthesizing both textual data and visual data in the form of a pathology slide:

Figure 8: Example of an immediate clinical application question



26. A 30-year-old man is admitted to the hospital for evaluation. He has a 6-week history of colicky abdominal pain and diarrhea with occasional blood. Three days after admission, he suddenly develops peritonitis and sepsis. Despite appropriate care, he dies. At autopsy, examination shows a fibrinous exudate over the peritoneal and serosal surfaces, and a punctate opening is seen in the wall of a thickened loop of small intestine. Several lengths of the small and large intestines are also thickened and adherent to one another, with marked areas of narrowing. Photomicrographs of a section of the colon are shown. Which of the following is the most likely diagnosis?

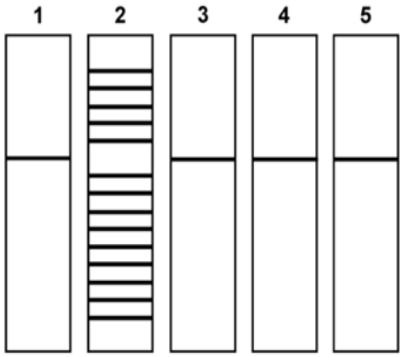
(A) Colon cancer
(B) Crohn disease
(C) Diverticulitis
(D) Ischemic necrosis
(E) Ulcerative colitis

In the eight-sentence question stem, the information necessary to answer the question constitutes a small narrative. The first sentence indicates the patient's age, sex and the fact of his hospital admittance. Though officially given as information by which to arrive at a correct diagnosis, information regarding the age and sex of the patient nevertheless situates patient-hood in a temporal and gendered space. The hospital stay, on the other hand, creates the institutional conditions of possibility for the photomicrographs. The fact that the patient will die in the hospital immediately places him in a network whereby his cadaver will be dissected by pathologists to

produce the slides. The next two sentences provide additional temporal details – a six-week period of pain and diarrhea as well as complications three days into his hospital stay – both of which strengthen a sense of temporal situatedness. The next sentence introduces the crucial turn that, under the given institutional conditions of possibility, create the question: the patient must die in the question-stem's "plot" in order for pathologists to analyze his internal organs and thereby produce the photomicrographs. The stipulation that he received "appropriate care" rhetorically protects the legitimacy of biomedicine in face of the patient's death, necessary as it is for the question. These details make the remaining sentences describing the pathology results legible: following this narrative, the results can be easily followed.

An example of a lifelong learning question is given in Figure 9. The question tests the student's knowledge of a basic research technique – the Southern blot – in accordance with the expectation that she will remain familiar with emerging biomedical research, which could require some understanding of this and other advanced research techniques.

Figure 9: Example of a lifelong learning question



Lane 1: Liver
Lane 2: Bone Marrow
Lane 3: Kidney
Lane 4: Cerebellum
Lane 5: Pancreas

9. During an experiment, a Southern blot analysis is done by digesting DNA samples with a single restriction endonuclease, separating the digestion products by gel electrophoresis, and transferring them to a filter. The investigator probes the filter by exposing it to a cDNA clone that encodes a single immunoglobulin-constant region. The figure shows the resulting pattern with DNA samples isolated from different organs. Assuming there were no technical errors, the Southern blot analysis results demonstrate which of the following processes?

(A) Affinity maturation
(B) Apoptosis
(C) Gene rearrangement
(D) RNA splicing
(E) Somatic hypermutation

Compared to the question stem of the immediate clinical application question, the lifelong learning question is a-temporal, institution-less, and disembodied. The first sentence uses passive voice to make the technique the central focus of the question and yet in so doing removes the body performing the analysis. Though a human form – "the investigator" – does appear in the subsequent sentence, it lacks body, gender, age or any other attribute, save for the implied ability to decide how to probe the digestion products. There is also no sense of the institutional conditions in which the experiment unfolds. There is however one salient common feature between it and the immediate applicability question. Just as the clinical application question includes a stipulation that "appropriate care" preceded the patient's death, so too does the final sentence of the lifelong learning question stipulate that "there were no technical errors." Both statements shore up the legitimacy of biomedicine, particularly in the instance where the outcome following medical

treatment was death. The similarity ends there for in the application question the stipulation is a positive – "there *was* appropriate care" – whereas in the lifelong learning question it is a negative – "there were *no* technical errors."

This and the other aesthetic differences between the two questions enact or afford the applied-pure cognitive styles. The two questions do not just highlight mere material differences between the "purity" of the basic research disciplines – biology, biochemistry, microbiology – and the "applicability" of medicine: the applied-pure opposition is more than just a function of the latter dealing with Southern blots, the former with bodies in pain, bloody diarrhea and pathology slides. In these questions, the difference is every bit as stark as that between urgent immediacy and abstract deferral. The applicability question has temporality, embodiment, an institution and positive assertion; the lifelong learning question is a-temporal, unembodied, a-spatial and features a negative denial. The question is also concrete yet teleological: the details that make it concrete are only there to build toward the objective of the question, which includes the ability to read and interpret photomicrographs so as to arrive at a diagnosis, a much if not the most sought-after payoff in medicine, as the next section on the electronic medical record will demonstrate. The lifelong learning question, while still teleological, does not payoff as a diagnosis does. The payoff of a lifelong learning question is, by definition, deferred when payoff is narrowly defined as a benefit to human health. The stark contrast between the immediate payoff of a diagnosis and the deferment of a basic research technique affords applied and pure cognitive styles, respectively.

The gap between immediate application and lifelong learning extends to the practice of learning and preparing for exams by mnemonics. While hardly associated with exams in any official capacity, mnemonics nevertheless surrounds medical school exams in the practice of studying. Indeed, the preferred review book for the USMLE STEP 1, known colloquially as "First-

Aid," abounds with them. As memory devices – or cognitive forms – that allow for rapid consolidation of varying quantities of related information at once fragmentarily distinct yet easy to confuse and difficult to recall, mnemonics proliferate in medical school where tremendous quantities of such material are tested in short periods of time. Lewis uses a scene about the voluminous anatomical knowledge expected of medical students to nest in *Arrowsmith* the formal interplay of exam and mnemonic. Anatomical knowledge takes the form of "lists of names" – that is to say, names of innumerable muscles, nerves, bones – and it is these lists "which enable a man to crawl through exams and become an Educated person" (Lewis 20). Yet these lists must be memorized, a necessity that "unknown sages" addressed by "invent[ing] rimes." The mnemonic's mysterious origin, along with their characterization as rime, an archaic spelling of rhyme, outfits them with an ancient gravitas.

The eponymous protagonist of Lewis' novel, Martin Arrowsmith, uses one such received rime – "On old Olympus' topmost top, a fat-eared German viewed a hop" – to retain the names of the twelve cranial nerves. The first letter of each word is associated with each of the twelve cranial nerves: olfactory, optic, oculomotor, trochlear, trigeminal, abducens, facial, vestibulocochlear (the "ear" cranial nerve), glossopharyngeal, vagus, accessory, and hypoglossal. Viewed with respect to the mnemonic, the figurative "crawling through exams" and the figure of the "Educated person" that emerges from them assume devastating meanings. It is less the mere fact of exam difficulty that makes the students crawl through the exams: it is the combination of difficult task and woefully insufficient tools by which to complete it – lists memorized by mnemonics – that make for the crawling. What emerges from the other side of the crawling is not a professional with a solid grasp of the structural complexity of the cranial nerves, but rather something bordering on a charlatan who can put on a bombastic air by virtue of having persevered through a trial both

difficult and stupid. Hence, the bombast of the capital-E in "Educated person," the education of whom amounts to the mastery of cognitive tchotchkes.

Referring in everyday language to cheap baubles, tchotchke in the context of mnemonics for medical school exam preparation emphasizes the sort of vulgarity that Pasteur describes when he discusses the distinction between applied and theoretical sciences. In terms of the tree-apple metaphor Pasteur uses to explain the inextricable, non-categorical interconnectedness of the two sciences, the mnemonic is akin to an apple not only completely cut off from the tree but fetishized for its momentary usefulness. Yet for Martin Arrowsmith's medical school compatriots, the hyper-usefulness of tchotchke becomes the more lingering, long-lasting uselessness of art, unexpectedly leaving a lasting impression that extends beyond medical school. The students "remembered it for years after they had become practicing physicians and altogether forgotten the names of the nerves themselves" (Lewis 20). The mnemonic's anatomical association – the object of its immediate applicability – vanishes yet its pure shell endures, the rime being, to the ears of the students, the "world's noblest poem." Whereas the mnemonic silliness affords memorability leading up to and during the exam, long after the exam, it is beautiful, yet apparently useless. Considered across a temporal span divided into 'pre-exam' and 'post-exam,' the mnemonic serves as a veritable archetype of the pure and applied pattern: leading up to and during the exam, the mnemonic is applicability; following the exam, it is pure.

A more recent version of the mnemonic given in pares down poetic beauty and in so doing shifts the balance across applied-pure lines toward immediate use:

Figure 10: A recent version of the cranial nerve mnemonic indicated by the blue arrow

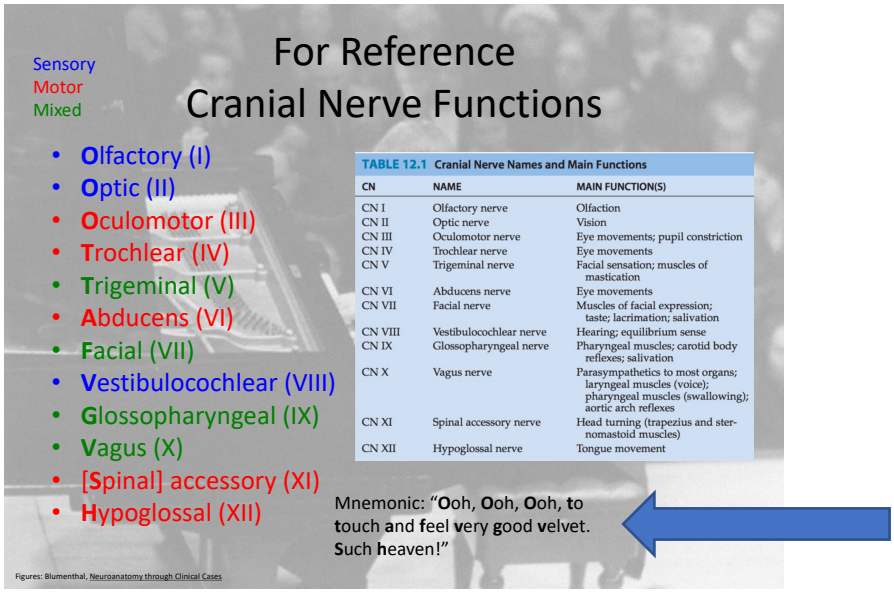


TABLE 12.1 Cranial Nerve Names and Main Functions

CN	NAME	MAIN FUNCTION(S)
CN I	Olfactory nerve	Olfaction
CN II	Optic nerve	Vision
CN III	Oculomotor nerve	Eye movements; pupil constriction
CN IV	Trochlear nerve	Eye movements
CN V	Trigeminal nerve	Facial sensation; muscles of mastication
CN VI	Abducens nerve	Eye movements
CN VII	Facial nerve	Muscles of facial expression; taste; lacrimation; salivation
CN VIII	Vestibulocochlear nerve	Hearing; equilibrium sense
CN IX	Glossopharyngeal nerve	Pharyngeal muscles; carotid body reflexes; salivation
CN X	Vagus nerve	Parasympathetics to most organs; laryngeal muscles (voice); pharyngeal muscles (swallowing); aortic arch reflexes
CN XI	Spinal accessory nerve	Head turning (trapezius and sternomastoid muscles)
CN XII	Hypoglossal nerve	Tongue movement

Taken from a lecture Slide from learning Session 22 of the Spring 2016 Neuroanatomy Course, one of twelve courses that comprised the M1 curriculum at University of Illinois College of Medicine at Urbana-Champaign, the updated mnemonic reads: "Ooh, Ooh, Ooh, to touch and feel very good velvet. Such heaven!" Together, the two cranial nerve mnemonics – *Arrowmsith's* "On old Olympus' topmost top, a fat-eared German viewed a hop" and the University of Illinois neuroanatomy course's "Ooh, Ooh, Ooh, to touch and feel very good velvet. Such heaven!" – furnish a rather simple exposition of a form's historical and cultural specificity as well as its lasting transposable generality.

Both versions are twelve-word sentences with words that begin with the letter of the corresponding cranial nerve. Yet the words selected to fill this general template create two distributions of attention across applied-pure lines. The *Arrowsmith* mnemonic lavishes comparatively more attention on the pure, crafting a 'rime' that includes an allusion to Greek mythology and expresses an overall whimsical image. Perhaps most decadently of all, the

mnemonic ventures a rule-breaking pun (making "ear" instead a word starting with 'v' to stand for vestibulocochlear, the ear-cranial nerve). Such choices make it a better candidate for poetry than the later version, which makes little, if any, attempt at literary inventiveness. The opportunity for inventiveness afforded by the challenge of three consecutive O's is sacrificed to a repetitive onomatopoeia – "Ooh, ooh, ooh" – that is supposed to express the sounds of pleasure elicited by touching "very fine velvet." In this sense, the mnemonic achieves an internal logic that could be said to achieve cohesion. Moreover, 'touch' standing for the trigeminal nerve – the nerve of facial sensation – invites comparison with the rule-breaking pun in the *Arrowsmith* mnemonic. In adhering strictly to the rule of the mnemonic form that stresses perfect equivalency between the name of the scientific material and the letter of the first work, the University of Illinois mnemonic perhaps promises more straight-forward retrieval and thus decreases the likelihood of misremembering on an exam. The later mnemonic affords transparency and clarity; the latter, whimsicality and play. As whimsicality and play are not formally compatible with exam questions, they are not useful for arriving at correct responses, making the University of Illinois mnemonic the more 'applicable' mnemonic.

Taking a closer look at the post-exam fate of this tchotchke, their comparatively longer shelf-life than scientific knowledge may help explain the malaise medical epistemologist Kathryn Montgomery observes in a student after his first year: "'I'm not learning science,' he said dully. "I'm not even learning facts anymore; I'm just learning *things*'" (Montgomery 7). Given neither the student nor Montgomery specify what exactly distinguishes 'science' from 'facts' from 'things,' it may be that mnemonics are the 'things' of which they speak. If this is the case, then it becomes possible to say that what occasionally, or often, passes for learning in medical school

may be called thingification as the medical student races against the clock to hold the necessary knowledge in their heads to pass exams.

4.2.2 Electronic Medical Record: The Applied-Pure in Patient Care

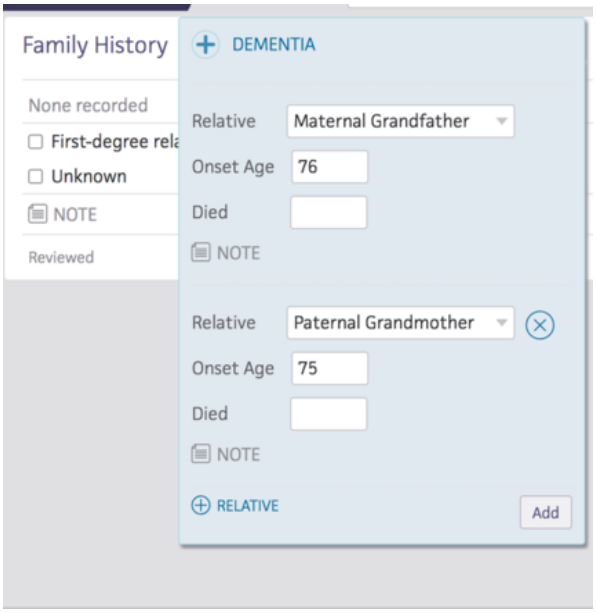
Tracing the patterns of use to the realm of patient care leads to the Electronic Medical Record (EMR), a form that exerts at least as considerable an influence over patient care as the examination and mnemonics do with medical education. The EMR began to overtake more traditional paper medical records after 2009 when the American Recovery and Reinvestment Act (ARRA) incentivized EMR adoption. Another major force driving the adoption of EMR's is the financial one, EMR's supporting the needs of both insurance claims and billing. There are many EMR platforms that private practices and hospitals may elect to use. For the purposes of this discussion, the EMR platform under consideration is AthenaNet, the property of the health technology company athenahealth and the EMR used by Avicenna Community Healthcare Center of Champaign, Illinois. Though the advent of health technology has introduced numerous changes, AthenaNet, like most EMR's, nevertheless preserves the standard structure of the medical history, which is organized into six sections: chief complaint (CC), history of present illness (HPI), past medical history (PMH), family history (FH), social history (SH), review of systems (ROS). The total information collected in the interview comprises the medical history section in the patient chart.[9] Under the condition where physical diagnosis is the desired payoff of patient care, in every sense of the word, the six parts of the medical history together with the applied-pure cognitive styles, of the CC, FH, ROS affording the applicability of arriving at or managing a diagnosis, with

[9] Rounding out the chart for any given visit is the physical examination, laboratory test results, and clinical notes which include the assessment of the overall clinical situation and the plan for clinical interventions.

the SH affording the purity of possibly helping to arrive at a diagnosis and the HPI and PMH an unstable hybrid of the two.

In accordance with biomedicine's insistence on physical, localizable causes of sickness, the first part of medical history – the chief complaint – beckons for a single physical ailment such as a cough, localized pain or fever. That this first part of the medical history is singular and not plural – complaint not complaint*s* – helps to contain the clinical situation into a manageable whole. As such, the chief complaint is short, often less than a sentence. Moreover, it enacts use in that it directly and concisely captures verbal descriptions of the sought-after payoff: identification or management of diagnosis. Both the Review of Systems (ROS) and the Family History (FH) enact patterns of use to the extent that they also contribute additional material about physical examination from which the diagnosis is formed. In the AthenaNet EMR, the FH section provides a list of diagnoses to which family members of the patient can be added (see Figure 11). The physician can add as many as have been diagnosed with the given condition. Under each family member, only the age of onset and the date of death are listed. For more detail, there is the note section.

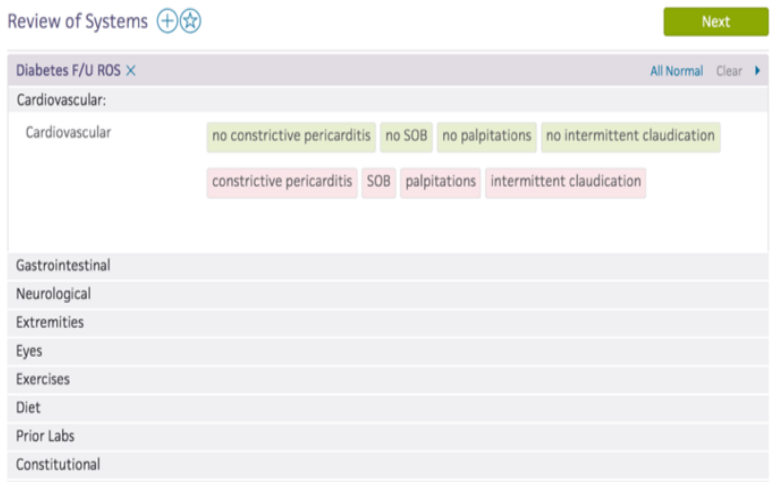
Figure 11: Family history section from AthenaNet



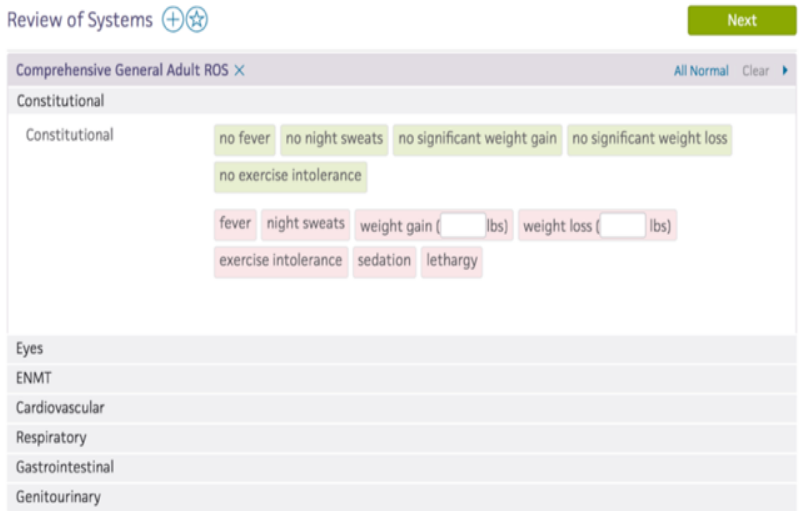
The Review of Systems section, on the other hand, is more formally complex than the FH as there are numerous ROS templates to choose from. Some templates may afford clinical immediacy better (such as the Diabetes Follow Up template) and some of which may afford deferral better (such as the Comprehensive General Adult template). The same bodily systems that organize the USMLE Step 1 – e.g. cardiovascular, gastrointestinal, genitourinary – also determine the categories by which ROS templates are sorted. Incidentally, such categorization does not easily support a multi-system perspective for which STEP 1 also tests. Indeed, an ROS template separated into system categories makes integration across systems more difficult to record. In any case, each system category in turn consists of pertinent positives and pertinent negatives, with the constituents of each category varying across templates (see Figure 12).

Figure 12: A comparison of two ROS templates, diabetes follow up and comprehensive general adult ROS from AthenaNet

Diabetes Follow Up ROS



Comprehensive General Adult ROS



To be sure, both the ROS, particularly the Comprehensive General Adult template, and FH may elicit topics that do not necessarily bear on the stated chief complaint and therefore would not necessarily contribute to its diagnosis. In this sense, both sections could also be said to enact deferral, demonstrating how affordance is less an essential quality unilaterally determining what a

form does and more a question of contingency. In the hands of two different physicians, the ROS and the FH might vary with respect to how closely they hew to the chief complaint. If a physician still chooses the Comprehensive General Adult template rather than Diabetes Follow Up template during an encounter with a patient whose chief complaint is related to diabetes, then the ROS affords clinical deferral. Yet the limits on the ROS and FH nevertheless demarcate a range of possibility that enables them do applicability better than social history, the part of the interview that best affords the theoretical or the pure in patient care. For unlike the ROS and FH, the SH need not be about physicality and thus has a much larger range of possibility.

As such, the SH serves as the receptacle for all the information that, while not itself physical or bodily, nevertheless has the potential to make the management of the physical more effective or efficient. *Smith's Patient Centered Interviewing* evokes as much by pointing out that "the list of potential topics of inquiry in the SH is extensive and *may not seem relevant* to the reason the patient is seeking health care. However, understanding these aspects of the patient's life can aid you in diagnosing the chief concern, helping the patient recuperate after hospital discharge and keeping the patient healthy by addressing harmful behaviors" (Dwamena et al. 110, italics mine). In comparison to the rigidly circumscribed information elicited in the CC, FH and ROS, the SH is indeed comparatively vast and unsystematic. AthenaNet's social history features approximately 42 items, which vary widely as to how to record answers. The items come as either a pre-populated dropdown menu, a panel with three or four choices or a simple free response, as shown in Figure 13.

Figure 13: Three types of information collecting formats in AthenaNet's social history section

Drop-down Menu	Sexual orientation ✓ Lesbian or gay or homosexual / Straight or heterosexual / Bisexual / Something else / Don't know / Choose not to disclose NOTE Substance abuse NOTE Last modified by rsanders55 | 06-20-2 Quit for cardiac concerns
Panel	General stress level Low Medium High NOTE
Free Response	Illicit drugs Heroin

Since the category of social history does not exhibit the uniformity that the exclusively bodily categories of FH and ROS do, it thus demands a more variable way of recording responses. Yet like the ROS and FH forms, these response recordings afford speed: only the free response could be said to afford a slower, more reflective response and yet the short space affords a quick response.

Moreover, the 42 items that comprise the SH are not neatly categorized into bodily systems or diagnostic categories as with the ROS and FH, respectively. Rather, they are simply one long list, given in the following order:

1. Smoking status
2. Tobacco- years of use
3. Occupation
4. Education
5. Marital status
6. Sexual orientation
7. Exercise level
8. Diet
9. General stress level
10. Smoking – how much
11. Has smoked since age
12. Alcohol intake
13. Caffeine intake
14. Chewing tobacco
15. Illicit drugs
16. Guns present in home

17. Seat belts used routinely
18. Smoke alarm in home
19. Advance directive
20. Performs monthly self-breast exam
21. Legally blind in one or both eyes
22. Hard of hearing or deaf in one or both ears
23. Use IV drugs
24. Sexual partner has HIV
25. History of inconsistent/no condom use
26. High number of sexual partners
27. Is the patient ambulatory
28. Are you currently employed?
29. Are you currently sexually active with anyone who has traveled (within the last 12 weeks) to a zika-affected area?
30. Caregiver
31. Changes in family/social situation
32. Childcare
33. Concerns about meeting basic needs (food, housing, heat, etc.)
34. Do you feel stress – tense, restless, nervous, or anxious, or unable to sleep at night because your mind is troubled all the time – these days
35. Does family ever have difficult making ends meet at the end of the month?
36. Have you traveled out of the country in the past 30 days?
37. Illicit drugs – years of use
38. International travel
39. Number of children
40. Protected sex
41. Sexual orientation *6 choices
42. Substance abuse

A more thoughtful organization than a 42-item list is certainly possible, yet the FH section shows no attempt to do so: sexual health is scattered among items 6, 24-26, 29, 40 and 41; substance use is scattered among items 1, 2, 10-15, 23, 37; home life is scattered among items 5,7,8,9, 16, 17, 18, 27, 30-35. In view of this scattering of items that presumably belong together, the FH is arbitrary and carelessly formulated. Sexual orientation, for example, appears twice, with the first instance in item 6 giving three fewer selections than the instance in item 41. Perhaps most irresponsibly, the presence of item 20 – "performs monthly breast examinations" – makes the absence of an equivalent question for testicular self-exams all the more deafening.

In the History of Present Illness (HPI) and the Past Medical History (PMH) lies a possible bridge between the clinical immediacy of the physically-oriented diagnosis, ROS and FH and the pure remoteness of the social history. Of all the component parts of the medical history, the HPI and the PMH best affords narrative. Indeed, the HPI seeks to establish all of the pertinent details that both define and surround the chief complaint, sometimes necessitating a return to past medical history. The openness of and similarity between the two sections are demonstrated by what is ultimately their indistinguishability: "the distinctions [between HPI and PMH] are not always clear and there are no evidence-based guidelines to determine where you should obtain or record historical data" (Dwamena et al. 103). Yet the narrative affordance of the HPI and PMH often clashes with the one of the affordances of the electronic platform: a simple copy-pasting of the data from any of the other EMR sections. Where hand-written charts afford a slowing down long enough to write a general intuitive impression of the patient, the EMR affords the substitution of everything else in the chart for an HPI.

4.2.3: Peer-reviewed Journal Article: The Applied-pure in Research

Unlike written medical school exams and EMR's, peer-reviewed journals explicitly incorporate applied-pure language, as *The Journal of Applied Toxicology* would demonstrate. The differences between *The Journal of Applied Toxicology* and what would be a plausible candidate for its pure counterpart, *Toxicology*, do not, however, as their titles would suggest, themselves consolidate applied and pure cognitive styles. Squaring their titles with the type of research they seek to publish immediately shows why. On the one hand, the goal of *Toxicology*, as defined in its author guidelines, is "to advance current understanding of the mechanisms of toxicity" (Toxicology). Yet the journal nevertheless has its eyes toward practicalities that would enact use, seeking to advance toxicological understanding "as it relates to human health" and placing emphasis on "effects observed at or extrapolated to relevant human exposures that contribute to safety evaluations and risk assessment decisions." In this way, *Toxicology* has more applied leanings than its name or primary goal might initially suggest.

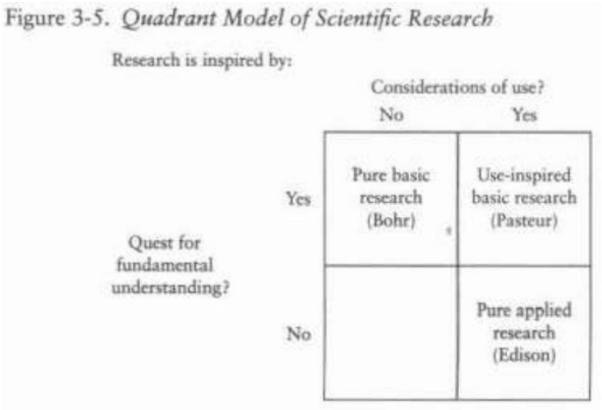
The aims and scopes of the *Journal of Applied Toxicology*, on the other hand, is to publish "peer-reviewed original reviews and hypothesis-driven research articles on mechanistic, fundamental and applied research relating to the toxicity of drugs and chemicals…" (Applied Toxicology). The importance the journal assigns to mechanistic and fundamental research indeed begs the question of what function the title serves. If the journal does publish "fundamental or mechanistic research," which is to say, pure, theoretical or basic toxicological research, the necessity to specify that it is a journal of applied toxicology becomes curious. One explanation for the perhaps unwarranted prominence given to applied by its position in the title can be lifted from the last sentence of the 'Aims and Scopes' section: "emphasis is given to papers of clear application to human health and/or provide significant contributions and impact to their field." If the nature of

the papers the journal seeks to publish is any indication, the titular applied means high-impact in the sphere of human health.

Setting aside the potentially misleading nature of any applied-pure distinctions evoked in their titles, the attention that both *Toxicology* and *Journal of Applied Toxicology* give to questions of human health and contributions to basic knowledge adheres to the ideal of use-inspired basic research put forth by engineer Donald Stokes. Stokes offered use-inspired basic research as an alternative to an influential 1945 report to President Franklin Roosevelt by then-head of the U.S. Office of Scientific Research and Development, Vannevar Bush. Entitled *Science, the Endless Frontier*, Bush's post-armistice report set the path for peacetime scientific research. To do so, it appropriated the so-called linear model of scientific research whereby pure research laid the foundations for innovation in applied research. The report went on to influence the scientific priorities of U.S. policy for generations and indeed became a fixture of governmental funding schemes. Hoping to move U.S. research policy away of the antiquated linear model, Stokes expanded the model by two dimensions, giving the quadrant model.

First introduced by Stokes in his 1997 book *Pasteur's Quadrant: Basic Science and Technological Innovation*, the eponymous quadrant – the Pasteur Quadrant – constitutes what Stokes considered the privileged space of his so-called Quadrant Model of Scientific Research (see Figure 14 below). Stokes pointed to this quadrant as the area in which to direct resources and research efforts, it being an intellectual domain in which researchers simultaneously produce knowledge about the world and develop technology to improve the human condition.

Figure 14: The Quadrant Model as Pictured in Pasteur's Quadrant: Basic Science and Technological Innovation *by Thomas Stokes, pg. 73*



Yet in *Cycles of Invention and Discovery* (2016), Odumosu and Nayaranamurti rightly point out that Stokes' "very nomenclature reinforce[s] the binaries of the linear model. Pasteur's Quadrant be[comes] the quadrant of 'use-inspired basic research' - still compatible with the linear model binary of 'basic' and 'applied' research" (Narayanamurti and Odumosu 29). As such, the patterns of use-inspired basic research can still enact applied-pure cognitive styles.

The topic of oxidative stress and free radical mechanisms clarify the nature of use-inspired basic research in toxicology and thereby provide one way of understanding the enactment of applied-pure cognitive styles in research. The special mention given to oxidative stress and free radical mechanisms in the guidelines of the *Journal of Applied Toxicology* is unsurprising given the topic's prominence in not only toxicology but other fields as well. Oxidative stress refers to a state whereby highly reactive compounds known as reactive oxygen species (ROS) overwhelm bodily defenses and go on to react with and thereby cause damage to DNA, proteins and other important biological molecules. The *anti*-oxidants for which certain foods and supplements are celebrated refer to their action *against* ROS, which arise from the biochemical process of aerobic, which is to say, oxygen-using respiration that sustains millions of life forms on Earth. With the promise of elucidating a crucial aspect of a fundamental process for many lifeforms (aerobic

respiration) while addressing neurodegenerative disease, cancer, aging, cataracts, rheumatoid arthritis, cardiovascular disease, autoimmune disorders and other maladies in which oxygen toxicity has been implicated, research on reactive oxygen species and free radical mechanisms easily fits under the use-inspired basic research category, the so-called Pasteur Quadrant.

Advising researchers hoping to publish research pertaining to free-radical mechanisms, the *Journal of Applied Toxicology's* guidelines note that "biochemical endpoints alone of a single organ/tissue response are considered not to show sufficient scientific depth." In order to achieve scientific depth, a mechanism has to not only articulate the biochemical endpoints of a response but must, presumably, give a coherent explanation of all biochemical interactions as well. This requirement anticipates a basic cognitive style. As for the applied cognitive style, the guidelines specify that "this journal is not the place to make health claims on natural food stuffs or botanical extracts particularly in association with amelioration of free radical/ROS type mechanisms." Aside from effectively discouraging naturopathic-oriented research, this caveat makes a check on immediacy qua innovation in human health. In a clear instance of disciplinary boundary drawing, the journal does not consider research on the health effects of naturopathic substances as part of its mission to enhance human health through toxicological knowledge, even if, presumably, their association with ROS or other mechanisms could be established. In any case, this caveat is situated within a mission that calls for an applied cognitive style.

Altogether, in order to clear the peer review process and be published in the *Journal of Applied Toxicology*, submissions must make impacts on human health while enacting scientific depth. The journal articles in turn demonstrate what a successful, which is to say, publishable enactments of health impact and scientific depth look like. Accordingly, the journal articles, as forms or formats in their own right, exhibit patterns of use-inspired basic research. As the

forthcoming analyses attempts to show, the research and the review article, in conjunction with the journal guidelines specifying what will and will not be published, both do use-inspired research differently.

The author guidelines of *Applied Toxicology* declare that the journal publishes five article formats: research articles, short communications, reviews, mini-reviews, hypothesis reviews. By explicit recognition, the guidelines perhaps promote the experimental section as the preeminent formal feature of research articles, which "must be precise and give all details necessary for repeating the work." The defining formal feature of short communications is length and an abstract. The guidelines define reviews of a current topic of interest against complete literature surveys and "assemblages of detailed information," stipulating that they should instead render a "critically selected treatment of material" along with discussion of "unsolved problems" and "possible developments." Minireviews are reviews under 10,000 words. Finally, hypothesis reviews are defined as "theoretical papers." *Toxicology*, on the other hand, approaches the distinction between a research article and a review article with fewer stipulations, declining to further categorize review articles, save for a distinction made on the basis of length – reviews vs. mini-reviews.

Though the review articles and research articles are most often framed, as they are in the Applied Toxicology guidelines, as the distinction between primary sources and secondary sources or between original research and synthesis, the distinction itself may also afford different patterns of the use-basic balance. Indeed, contrary to the *Journal of Applied Toxicology's* label of Hypothesis Reviews as "theoretical papers," it is perhaps the review article form that affords an emphasis of use over basic. The research articles, on the other hand, affords an emphasis of basic over use. By articulating these patterns of use across the review article and the research article

across two different journals – *Journal of Applied Toxicology* and *Toxicology* – it becomes clearer how their patterns afford applied-pure cognitive styles.

4.2.3.1 Research Articles

Research articles have a rigidly conserved structure that endures across journals. This structure consists of six basic features: **1) title**, which is usually a terminology-dense sentence that lays out the major finding and its significance. Following the title is the **2) paper abstract**, which compresses all the sections into one paragraph. The **3) introduction** presents the problem under discussion, which integrates a literature review of all relevant factors; in the case of toxicology research, the introduction will cite relevant literature surrounding the compound under investigation as well as the pathological condition in which that compound is implicated. The **4) materials and methods** section is the site of enacting scientific reproducibility. It is also the section that Mol singles out in her reflections on practice, finding that it "instantiates the recognition that the practices forcing an object to speak are crucial to what may be said about it" (158). **5) The results** section states the research outcomes, or, to adopt Mol's phrasing, what the object has said after having been forced to speak by the practices outlined in the preceding section. Finally, **6) the discussion** speculates on these outcomes, often ending with directions for future research. By tracing these conserved features across the two journals, a picture of use-inspired basic research emerges.

Figure 15: The titles of two research articles in The Journal of Applied Toxicology (top) and Toxicology (bottom):

RESEARCH ARTICLE

WILEY Journal of Applied Toxicology

Epigallocatechin-3-gallate partially restored redox homeostasis in arsenite-stressed keratinocytes

ELSEVIER

Contents lists available at ScienceDirect

Toxicology

journal homepage: www.elsevier.com/locate/toxicol

Neuroprotective effect of zolpidem against glutamate-induced toxicity is mediated via the PI3K/Akt pathway and inhibited by PK11195

Beginning with titles (see Figure 15 above), the research article from *Toxicology* – "Neuroprotective effect of zolpidem against glutamate-induced toxicity is mediated via the PI3k/Akt pathway and inhibited by PK11195" – presents a use-inspired patterning by way of its five most prominent words or phrases:

1. a compound of interest (zolpidem)
2. a pathological process (glutamate induced toxicity, a sub-category of oxygen toxicity)
3. one of its possible salubrious effects (neuroprotection)
4. an explanation for the effect (mediation via the PI3k/Akt pathway)
5. and an inhibitory factor to the above effect (PK11195).

The research article from *Applied Toxicology* – "Epigallocatechin-3-gallate partially restored redox homeostasis in arsenite-stressed keratinocytes" – exhibits many formal similarities to its 'pure' counterpart, consisting of the following four words or phrases:

1. a compound of interest (Epigallocatechin-3-gallate)
2. a pathological process (arsenite-stress)

3. one of its possible salubrious effects (partial restoration)
4. an explanation for the effect (redox homeostasis)

Both titles show enactments of scientific depth and application to questions of health. The scientific depth is enacted in the explanation for the effects and the use of names given by systematic nomenclature. The presence of an explanation for the effect further enacts scientific depth. The arrangement of these elements to connect a compound which is not currently used in medicine to a pathological process encountered in medicine enacts applicability to health.

Turning toward the introduction of research articles, the introduction of the *Applied Toxicology* article consists of four paragraphs. The first paragraph establishes the relationship between arsenic toxicity and skin. The second paragraph introduces the compound of interest. The third paragraph, the longest of the four, introduces the pathway by establishing it as a point of intersection between the compound of interest and the pathological process. The final paragraph ends with the introduction of a mystery: whether the compound of interest and the pathological process interact with the given mechanism via the same biochemical channels or not. As for the *Toxicology* article, the introduction also consists of four paragraphs, with the first one establishing the pathological process under consideration – glutamate-induced toxicity – as a threat to neuronal homeostasis, or the process of maintaining a steady biological state in the brain's basic functional unit. The second paragraph, following closely from the first paragraph, establishes that this pathological process occurs in numerous neurological diseases. The third paragraph situates the compound of interest with respect to the pathological process. The final paragraph, which consists of two sentences, restates the article's title in the first and speculates on how the results might enhance the therapeutic strategies for a class of neuropathology in the second. In both journals, the paragraph structure demarcates a constant vacillation between use and basic.

Turing toward the materials and methods section, the iteration in the research article from *Applied Toxicology* boasts fifteen sections in the following order (Sarkar and Sinha 1072 - 1074):

1. Chemicals
2. Cell culture
3. Cytotoxicity assay
4. Reactive oxygen species generation
5. Comet assay
6. Determination of oxidative DNA damage
7. Lipid peroxidation
8. Nuclear and cytosolic protein extraction
9. Western blot
10. Immunocytochemistry
11. NAD(P)H dehydrogenase quinone 1 activity
12. Glutathione S transferase activity
13. Superoxide dismutase activity
14. Semiquantitative reverse transcription-polymerase chain analysis
15. Statistical analysis

The order of the materials and methods section displays a chronology of the experimentation as well as an applied-pure patterning. The first two sections deal with procurement: both simply list all the materials used, including chemicals and cells, and where they were purchased from. Sections 3 through 8 deal with questions of use: the corresponding methods and materials help determine the nature of the possible contribution to human health that the given compound in question would help make. Sections 11 through 15, on the other hand, deal with the basic: the corresponding materials and methods related to establishing the underlying physiological processes for the applications.

As for the article from *Toxicology*, the methodology has twelve sections, with one section having two sub-sections, all in the following order (Jembrek et al. 59-62):

1. Chemicals

2. P19 cell culturing and P19 neuronal differentiation
    a. P19 embryonal body formation (DIV 0-4)
    b. P19 neuronal differentiation (DIV 4-8)
3. Immunofluorescence staining
4. Drug treatment
5. Assessment of cell death
    a. Trypan blue exclusion assay
    b. Determination of ATP level
    c. MTT assay
6. Measurement of lactate dehydrogenase release
7. Detection of ROS levels
8. Determination of reduced glutathione (GSH) levels
9. Determination of caspase 3/7 activity
10. Determination of mRNA levels by semi-quantitative RT-PCR method
11. Western blot analysis of p53, Bax and pAkt expression
12. Statistical analysis

Along with its *Applied* counterpart, the materials and methods of the *Toxicology* article begins with chemicals and cell culturing. Section 3, together with sections 6 through 12, help to determine the basic whereas sections 4 through 5 would help to determine the applications to health.

The results section of the *Applied Toxicology* article consists of four sections, each of which states an experimental outcome:

1. Epigallocatechin-3-gallate increased the viability of arsenite-treated cells
2. Pro-oxidant activity of epigallocatechin-3-gallate increased along with arsenite
3. Epigallocatechin-3-gallate upregulated Keap1 and maintained a balanced status of Nrf2 in arsenite-treated HaCaT cells
4. Epigallocatechin-3-gallate modulated variable expression and activity of Nrf2 downstream targets in AsIII-stressed cells

(1074-1077)

All four section headings deal with the primary compound of interest (epigallocatechin-3-gallate) with respect to questions of use and questions of basic science. The first two section headings are concerned with the viability and pro-oxidant activity whereas the second two headings deal with biochemical pathways.

In the case of the *Toxicology* article, the results section consists of six sections, with the following titles (62 – 66):

1. Protective effect of zolpidem against glutamate-induced toxicity in P19 neurons
2. Effect of zolpidem on intracellular ROS production and GSH content following glutamate treatment
3. Increase in Akt activation mediates neuroprotective action of zolpidem
4. Effects of glutamate and zolpidem on the activation of programmed cell death
5. Effects of zolpidem on glutamate-induced changes of NMDA receptor subunits
6. Effects of zolpidem on neuronal survival are not mediated via $GABA_A$ receptors

In contrast to the results section of the *Applied* article, the results of the *Toxicology* article is not a declarative sentence stating outcomes but rather a sentence that states a basic *category* of an outcome. Nevertheless, as with the results section of its *Applied* counterpart, the central compound of interest – zolpidem – is studied with respect to both application and basic physiology.

In sum, if the first few sections of the research articles are any indication, the author guidelines that stress both basic scientific understanding and applications to human health are adhered to, as the mere fact of being published in the journals would presuppose. However, the exigencies of the materials and methods as well as the results sections ensure that basic ultimately supersedes use in research articles.

4.2.3.2 Review Articles

In comparison to research articles, review articles exhibit comparatively more formal variety as they are not required to adhere to the introduction, materials and methods, results and discussion format. This formal freedom, which is to say, a greater range of possibilities, arguably creates the space for emphasis of use over basic. In the case of *Applied Toxicology's* "Oxidative stress in organophosphate poisoning: role of standard antidotal therapy," the relevance to human health is explicitly asserted in the second part of the title (see Figure 16 below). As for *Toxicology's* "Advances in metal-induced oxidative stress and human disease," the relevance to human health is again patently asserted. In this way, the review article form may shift the use-basic balance toward use.

Figure 16: The titles of two review articles from The Journal of Applied Toxicology (top) and Toxicology (bottom)

REVIEW ARTICLE

WILEY Journal of Applied Toxicology

Oxidative stress in organophosphate poisoning: role of standard antidotal therapy

Toxicology 283 (2011) 65–87

Contents lists available at ScienceDirect

Toxicology

journal homepage: www.elsevier.com/locate/toxicol

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Review

Advances in metal-induced oxidative stress and human disease

Though the review articles lack the research rigidly defined structure of the research articles, they do attempt hierarchical arrangements of material. In the case of the review article from the Journal of *Applied Toxicology,* there are only two major sections, the first exhibiting two sub-sections and the second exhibiting three sub-sections (Vanova et al. 1058-1065):

1. Oxidative stress
    a. Role of oxidative stress in acute organophosphate poisoning
    b. Role of oxidative stress in subacute and chronic organophosphate poisoning
2. Oxidative stress in organophosphate antidotal therapy
    a. Atropine
    b. Acetylcholinesterase reactivators
    c. Benzodiazepines

The first section "Oxidative stress" consists of two sub-sections that relate the basic idea of oxidative stress to two uses: acute and chronic organophosphate poisoning. The second section, "Oxidative stress in organophosphate antidotal therapy," relates to drugs already in standard use

for antidotal therapy for the pathological process in question – organophosphate poisoning. Together these advance

In contrast, the *Journal of Toxicology* review article consists of nine major sections, the first eight of which are devoted to a metal implicated in disease. The ninth and final section summarizes a type of metal-oriented therapy (Jomova and Valko 65-82):

1. Iron
    a. Iron metabolism
    b. Oxidative stress and iron
2. Copper
    a. Copper metabolism
    b. Oxidative stress and copper
    c. Copper and human disease
        i. Cancer Neurological disorders
        ii. Chronic disease: diabetes, cardiovascular disease and atherosclerosis
3. Chromium
    a. Oxidative stress and chromium
    b. Chromium and human disease
4. Cobalt
    a. Cobalt and oxidative stress
    b. Cobalt and human disease
5. Cadmium
    a. Cadmium, oxidative stress and human disease
    b. Cadmium and antioxidants
6. Arsenic
    a. Arsenic, toxicity and free radicals
    b. Arsenic and human disease
7. Zinc
    a. Zinc, metabolism and oxidative stress
    b. Zinc and human disease
8. Lead

a. Lead and oxidative stress
b. Lead toxicity and antioxidants

a. Chelation of redox active iron and copper
b. Chelation of toxic metals

9. Metal-chelation therapy in medicine

In every section, a connection is asserted between the metal in question, the basic physiological process of oxidative stress and disease.

Moreover, the final sentences of each review article offer an action item that relates directly to human health. The final sentence of the *Toxicology* review article calls for a "design of dual functioning antioxidants, possessing both metal-chelating and ROS/RNS-scavenging properties" (82). The final sentence of the review article from *Applied* furnishes what could be called a more implicit call for action: "current therapeutic approaches in OP-induced oxidative stress via prevention of overstimulation of cholinergic nervous system (oximes and atropine) and central hyperexcitation (diazepam) do not seem to cover all possible mechanisms involved in this pathological process" (1066). The emphasis on use still remains insofar as the final sentence calls for new therapeutic approaches that take into account all the biochemical pathways involved in the pathological process in question.

The considerable effort to achieve the ideal of use-inspired research in the four peer-reviewed journal articles not only demonstrates that the difference between journal titles mean little – *Applied Toxicology* publishes research that is no more applicable than that published by *Toxicology* – but perhaps seeks to desperately overcome a problem that *Arrowsmith* predicted when it was published in 1926. Indeed, the novel anticipates, many of the "problems that torment the medical profession to this very day, including the competition of needs, goals and resources between those who identify themselves as clinicians and those who are scientists" (Markel 371).

The applied-pure patterning enacted by Martin's divided allegiance to patient care and research is what constitutes the novel's anticipation of this problem.

One patterning of Martin's divided allegiance is function of his two mentors: Gottlieb, an isolated bacteriologist and Dean Silva, administer and clinician described as beloved by the narrative voice. nests the Biglan opposition between the pure and the applied, between basic research and human use. This patterning appears during a discussion between Martin and "Dad" Silva, dean of the medical faculty and professor of internal medicine. The two stumble on the topic of Professor Gottlieb, the immunological research of whom becomes the object of Martin's fondest devotion early on in medical school. Overshadowed by Martin's almost fanatical devotion to Professor Gottlieb, his considerable, if less fiery devotion to "Dad" Silva is easy to miss. Nevertheless, Martin displays great fondness for Silva, setting up a twin-devotion that, like the applied-pure gap, is not easily reconciled. Indeed, in a conversation between Martin and Dean Silva that turns to Dr. Gottlieb, Dean Silva observes:

> It's all very fine, this business of pure research: seeking the truth, unhampered by commercialism or fame chasing. Getting to the bottom. Ignoring consequences and practical uses. But do you realize if you carry that idea far enough, a man could justify himself for doing nothing but count the cobblestones on Warehouse Avenue – yes and justify himself for torturing people just to see how they screamed – and then sneer at a man who was making millions of people well and happy! (120)

To the extent that isolated retreat requires a turning away from one's fellow human being – whether by studying non-human objects (cobblestones) or by turning away from human needs (ignoring extreme pain) – the pure is seen as an entirely selfish and inhumane. Of course, to follow counting a street's cobblestones could lead back out to use, say, by facilitating the discovery of a novel way

of paving major thoroughfares that affords greater stability, traction or cleaning. In contrast to Dean Silva, Professor Gottlieb is rendered in a satirical characterization given by the narrative voice as one so "devoted to Pure Science, to art for art's sake, that he would rather have people die by the right therapy than be cured by the wrong" (Lewis 123). The narrative voice's characterization posits in Gottlieb a hope for the triumph of theory over salvation. This hope would lead its possessor, if given the choice, toward an intervention with a fatal effect, successfully predicted by a scientific theory and away from an intervention with curative properties that nevertheless escapes or even contradicts theory. Such is the most extreme statement of a rub that the various Flexnerian forms try to negotiate.

4.3 CONSOLIDATING HARD-SOFT COGNITIVE STYLES: EVIDENCE HIERARCHIES, LEARNING OBJECTIVES AND MEDICAL TEXTBOOKS

The Biglan model's hard-soft dimension corresponds to the subject matter characteristic of systematicity. Evidence-hierarchies, learning objectives and textbooks display their own patterns of systematicity and as such demonstrate the paradoxically conserved, yet changing nature of hard-soft cognitive styles. In the case of evidence hierarchies, the hard-soft manifests as a strict division between questions with answers that require evidence grading versus questions that do not. In contrast to evidence hierarchies, which show hard and soft interacting side-by-side, learning objectives contribute to the erasure of the soft by privileging only technical interactions with curriculum material. Likewise, textbooks erase softness through distortions that present a hard, teleological view of research rather than a contingently relational view. Together, these three forms help form hard and soft cognitive styles across the Flexnerian enterprise.

4.3.1 Evidence-Based Medicine: Hard and Soft in Patient Care

The evidence hierarchy, the form that enacts a hard-soft patterning in patient care, is the chief innovation of evidence-based medicine, even if no evidence-based medicine discussions would describe it as such. Mariam Solomon's assessment of evidence-based medicine in *Making Medical Knowledge* (2015) helps to explain why. In her assessment, Solomon introduces the evidence hierarchy as a way of clarifying evidence-based medicine's somewhat baffling nature:

> Evidence of effectiveness has *always* been a basis (although not the only basis) for medical practice. The term "evidence-based medicine" evokes *no surprise* – indeed, it suggests business as usual – and is thus often baffling to newcomers. I think that it would have been more precise to have used a term such as "evidence-hierarchy medicine," to signal that in evidence-based medicine evidence is evaluated for both its quantity and its quality, with some kinds of evidence and some quantities of evidence regarded as better than others (106).

In a footnote, Solomon notes that the greater semantic precision of "evidence-hierarchy medicine" would have incurred more controversy. In any case, the primary work of evidence-based medicine is evidence grading. Indeed, evidence-based medicine's evidence-grading character emerges through the description given by the inaugural article of evidence-based medicine's fundamental aims: evidence-based medicine "de-emphasizes intuition, unsystematic clinical experience, and pathophysiological rationale as sufficient grounds for clinical decision making and stresses the examination of evidence from clinical research" (Evidence-Based Medicine Working Group 2420). Therefore, evidence-based medicine declares that, when clinical decision making is concerned, the systematicity of clinical research is superior to the systematicity of

pathophysiological rationale and, of course, far superior to unsystematic clinical experience and most superior of all to that veritable systematicity-resisting phenomenon, intuition.

To understand how evidence grading enacts hard, soft cognitive styles consider one of the most prominent evidence hierarches: that produced by GRADE working group. Founded in 2000 by an informal group of collaborators interested in improving the evidence grading systems of the health care industry, GRADE has since become a leader in the development of evidence and strength of recommendation guidelines. GRADE has thirteen centers in eleven countries, several of which are housed in such research universities as McMaster University, Krakow University and Freiburg University. The titular acronym stands for Grading of Recommendations, Assessment, Development and Evaluation. The inaugural article for GRADE features a schematic given in Figure 17 below that explains how GRADE develops recommendations. The process begins with a healthcare question, followed by a systematic review of all the studies that bear on that question. The outcomes of each study are summed and their effects are estimated. Crucially, the evidence for each outcome is assessed on a number of criteria including "imprecision," "inconsistency of results," and "study limitations" (Guyatt et al. 385). Two of the forms that help constitute the evidence hierarchy are the evidence profile (EP) and the summary of finding (SoF). The evidence profile breaks down the evidence with respect to given parameters whereas the summary of finding consolidates what the evidence says into a meaningful recommendation. Figure 17 below outlines this complex process of evidence grading.

Figure 17: GRADE working group's schematic for evidence grading

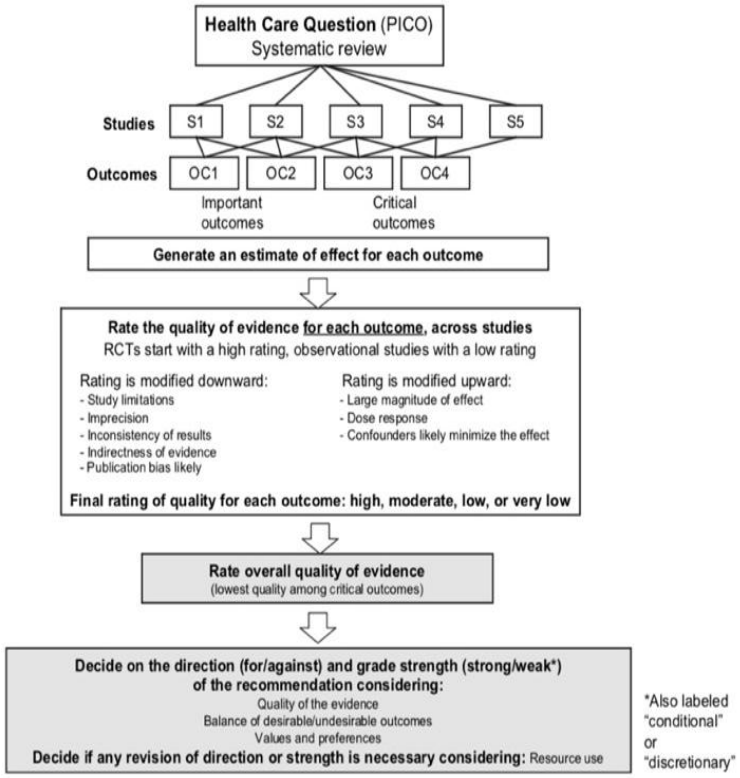


Fig. 1. Schematic view of GRADE's process for developing recommendations. *Abbreviation*: RCT, randomized controlled trials.

It is not so much process of systematic review itself that enacts the hard-soft patterns in patient care but rather *in the differential of healthcare questions to which the process is directed*. The article does not provide examples of the healthcare questions with which GRADE is concerned. Instead, the nature of questions may be inferred from a table that gives examples of literature findings that would constitute the answers to these important patient care questions. Entitled "Examples of best practice statements and statements that could be confused with motherhood statements," the table classifies various statements as having three different relationships to two parameters: helpfulness and need for evidence grading. A statement that is not helpful, i.e. the titular "motherhood statement," does not require grading, but a sentence that is helpful may require grading or it may not. Examples of the two are given in Figure 18 below.

Figure 18: Statements in need of grading versus statements that do not need grading

Recommendations that are not helpful	Explanation	Recommendations that may be helpful but do not need grading	Explanation	Recommendations that need grading	Explanation
In patients with hypertension, the PE should include an appropriate measurement of BP, with verification in the contralateral arm.	It is not clear what exactly the authors mean by "appropriate measurement of BP."	Pregnant women should be offered evidence-based information and support to enable them to make informed decisions regarding their care, including details of where they will be seen and who will undertake their care (LOE: C).	Most would consider a recommendation to not offer such information a violation of basic standards of care.	In patients with diabetes, monofilaments should not be used to test more than 10 patients in one session and should be left for at least 24h to "recover" (buckling strength) between sessions (LOE: C).	If there is only very low-quality evidence to support such a recommendation, clinicians should be aware of this, and the recommendation should be weak.

The hard-soft enactment occurs between statements that are helpful but do not need grading and those that do need grading. In the case of the example statement given for "recommendations that may be helpful but do not need grading," the question might be "What resources should pregnant women receive in regards to managing their own care?" (390). The answer involves offering information and supporting informed decisions, all of which amounts to addressing health literacy. Yet the crucial issue of health literacy becomes exists outside of systematicity by virtue of not requiring grading. Though it might be argued that a basic standard of care suggests a pre-existing system, this system is not given the same treatment as the system from which the example statement for "recommendations that need grading" emerges. The question to which this statement is the answer might be "How many diabetic patients can be tested using monofilaments in a single day and how long should the monofilaments be left to recover?" The use of monofilaments to test for diabetes, whatever the outcome of the systematic review process, nevertheless emerges from the standard paradigm of biomedical science, whereas the process by which to cultivate health literacy does not. Therefore, in distinguishing between what recommendations need grading and what recommendations do not, GRADE enacts the hard-soft cognitive styles.

Though *Arrowsmith,* published in 1926, appeared long before the advent of evidence-based medicine in 1992, it nevertheless nests systematicity-grading evidence hierarchies. In fact, the idea of the evidence hierarchy itself generates the fundamental tension that propels the book to its

climax on a fictional tropical island, St. Hubert. Armed with his expertise in infectious disease, Martin ventures to St. Hubert to develop a vaccine and test its effectiveness. Before Martin's departure, his mentor, Gottlieb, perhaps suspecting that his pupil will fail to achieve the rigor necessary to obtain definitive results on the vaccine's effectiveness, impresses upon him the need for a control group against which to compare the effects of the vaccine. To that end, Martin remains firm in his resolve to "sternly deprive" the vaccine to half the population right up until the images of suffering wrought by the plague begin to undermine it (375). One such image – that of "the face of terror – sunken, bloody eyes, drawn face, open mouth" – recalls a vision of his mentor, Gottlieb's own "sunken, demanding eyes," occasioning in Martin the revelation that "Gottlieb, in his secluded innocence, had not realized what it meant to gain leave to experiment amid the hysteria of an epidemic" (375). Under the conditions of secluded innocence, the rigor demanded by pure science is feasible, but under the grim realities of plague and human suffering, Martin finds it is not. Eyes represent the point of intersection that catalyzes Martin's decision. In what is perhaps the climactic decision of the novel, Martin abandons all plan of the control group and administers the experimental vaccine to anyone who needs it. Though the vaccine successfully stems further mortality, Martin leaves the island feeling like a fraud even as the rest of the world regards him as a hero.

Indeed, from a rigorously evidence-based perspective, he is a fraud. Ultimately, the decision to forgo controls and administer the vaccine to all islanders amounts to a rejection of the evidence hierarchy that places controlled randomized clinical trials at the top and mere clinical observation of 'symptom improvement' at the bottom. One way of describing the feelings of fraudulence and disappointment Martin experiences is to say that his formidable pure science aspirations buckle under the pressure to apply his discoveries to the chaos of the St. Hubert

epidemic and to its spectacles of human suffering. The applied-pure opposition and the hard-soft opposition are thus superimposed on one another.

To be sure, the St. Hubert episode does not represent the first and only evidence hierarchy nesting in the novel. The negotiation of evidence hierarchies appears as early as Martin's time in medical school and indeed may anticipate the Martin's rejection of them on St. Hubert. The most prominent negotiation occurs by way of a dialogue between Martin and one of his professors, Dr. Davidson:

> [Martin] inquired, and publicly, "Dr. Davidson, how do they know ichthyol is good for erysipelas? Isn't it just rotten fossil fish – isn't it like the mummy-dust and puppy-ear stuff they used to give in the olden days?"
>
> "How do they know? Why, my critical young friend, because thousands of physicians have used it for years and found their patients getting better, and that's how they know!"
>
> "Honest, Doctor, wouldn't the patients maybe have gotten better anyway? Wasn't it maybe a *post hoc, propter hoc*? Have they ever experimented on a whole slew of patients together, with controls?"
>
> "Probably not – and until some genius like yourself, Arrowsmith, can herd together a few hundred people with exactly identical cases of erysipelas, it probably never will be tried! Meanwhile I trust that you other gentlemen, who perhaps lack Mr. Arrowsmith's profound scientific attainments and the power to use such handy technical terms as 'control,' will, merely on my feeble advice, continue to use ichthyol!" (40)

A conventional heroic reading of this sparring would set up Martin as the uncompromising seeker of truth, whose exacting standards clash with Dr. Davidson's inferior, unsystematic clinical observations. As such, Martin would be, retrospectively speaking, an early defender of evidence-

based medicine. Moreover, the satirical forms make it easy to make Dr. Davidson into the narrow-minded antagonist that a heroic reading require. As a person who would have made an "illustrious shopkeeper" (39) and who boasts about his list of essential prescriptions having fifty more prescriptions more than his predecessor's, Dr. Davidson indeed fits the bill of antagonist against whose ignorance the hero must guard and eventually overcome. Yet retrospective consideration of Dr. Davidson's position in light of the later events of St. Hubert validates the general thrust of his reasoning. Martin forgoes the control group and administers his vaccine to all who need it on the wings of the hope that it will reduce the islanders' suffering. In short, Martin seeks to make them better, just as Dr. Davidson advises him to do in the Ichthyol lecture.

4.3.2 Learning Objectives: Hard-soft in Medical Education

Ichthyol constitutes one item from a list of 150 prescriptions that Dr. Davidson requires his students to memorize. When Martin, continuing his protest during the Ichthyol lecture, exclaims, "Please Dr. Davidson, what's the use of getting all these prescriptions by heart, anyway? We'll forget most of 'em, and besides, we can always look 'em up in the book," Dr. Davidson replies with a combination of humiliating infantilization and invocation of both his personal authority and that of the entire medical profession (Lewis 41):

> Arrowsmith, with a man of your age I hate to answer you as I would a three-year-old boy, but apparently I must. Therefore, you will learn the properties of drugs and the contents of prescriptions BECAUSE I TELL YOU TO! If I did not hesitate to waste the time of the other members of this class, I would try to convince you that these statements may be accepted, not only my humble authority, but because they are the conclusions of wise men – men wiser or certainly a little older than you, my friend – through many ages. But as I

> have no desire to indulge in flights of rhetoric or eloquence, I shall merely say that you will accept, and you will study, and you will memorize, because I tell you to! (Lewis 41)

Dr. Davidson's comments nest a different systematicity of medicine, which is to say, its reliance on past successes to justify present and future decisions. Dr. Davidson indeed appeals to a paradigm of past use: because the prescriptions have been successfully used in the past, they create a system for the present and future. The mutual reliance of the applied-pure and the hard-soft dimensions again emerges: what has been applied – which is to say, what has been used – can become hard – which is to say, integrated into the system of a curriculum. One requirement of the use-oriented paradigm theorized by the confrontation of Martin and Dr. Davidson, the relentless memorization of everything that is and ever has been demonstrated to be useful, recalls the necessity for the mnemonics, which is to say, the intellectual tchotchke that, once it has paid off on exams, endures more readily in memory than the scientific content it was supposed to cement.

The Flexnerian form that at once passes on and establishes the canon of knowledge while stoking the complex processes of thingification into tchotchke on behalf of systematicity is the learning objective. Learning objectives could be said to be the most minute unit of a medical curriculum. The first-year medical curriculum at the UICOM consists of twelve courses, each of which contains anywhere from 12 to 50 learning sessions. Each learning session, the most common format of which is the didactic lecture, must achieve anywhere from 5 to 12 learning objectives. The learning objectives ensure that students across UICOM's four campuses receive comparable educations. In this way, learning objectives enact hardness in the form of consensus. As the product of a curriculum committee that met and decided what the medical students graduating from the University of Illinois College of Medicine must know, the learning objectives indeed constitute a testament of consensus – at least among that group.

More broadly, the learning objectives constitute the most local and particulate cross-decade transmission of a much larger consensus. The learning objectives in fact perpetuate the system of priorities established in 1919 with the Association of American Medical Colleges (AAMC)'s standardization of what may be considered the curricular corollary of the Flexnerian revolution: "3600-4400 prescribed hours in anatomy, physiology, biochemistry, pathology, pharmacology, medicine, surgery, and obstetrics and gynaecology" (Whitehead 27). The systematic adoption of these broad content categories inaugurated in the United States nothing less than a canon of medical knowledge, all canons being, in the end, consensus-bolstered systems. Like now heavily contested cultural canons (e.g. the Western canon), the price the medical knowledge canon pays for consensus is the exclusion of other knowledge. Nevertheless, as the body of scientific knowledge that a competent physician was and is still expected to master – the same content categories appearing in the NBME's description of the STEP 1 content – this canon acts simultaneously and inextricably as an educational tool and a political entity. As tool, it prescribes the material necessary to learn and practice medicine. As entity, it exerts influence over institutions as well as the daily life of medical students. In this way, the learning objectives would serve as perhaps the most minute extension of a strategy aimed to produce competent physicians and thereby protect the public.

An email from the instructor of UICOM's 2015 medical biochemistry course demonstrates this dual function of learning objectives:

Figure 19: E-mail from UICOM educator regarding the first exam of the 2015 biochemistry course

[m1biochem] Upcoming Biochemistry exam information
m1biochem-bounces@med-mail.med.illinois.edu de la part de McPheeters, David Scott [dmcpheet@illinois.edu]
Envoyé : samedi 19 septembre 2015 16:52
À : m1biochem@med.illinois.edu

I wanted to let you know a little bit about your upcoming examine and offer a few suggestions:

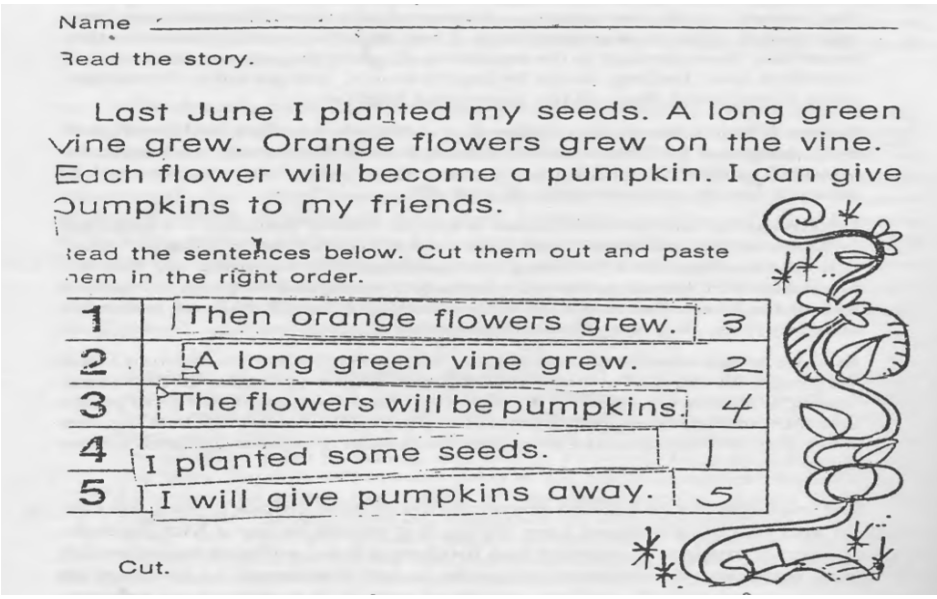
1) Use the Learning Objectives to guide your studying. Also, although I may have mentioned a lot of different things in my overviews of topics, you only need to know things I talked about in detail. Also, don't forget the summer pre-readings!

As exam study guides, learning objectives simultaneously shape both what material is emphasized and how medical students organize what is arguably the preeminent activity of medical school: studying. As such, learning objectives may be said to be more influential than exams with respect to how students learn. Though it may be tempting to assume that the necessity of passing licensing exams exercises more influence over medical school life than learning objectives, consider that the percentage of time spent actually sitting for exams, while not insignificant, is nevertheless dwarfed by the percentage of time studying for them.

While the significance of passing exams will ensure that student will study for hours on end, the learning objectives step in and significantly shape how the student actually spends those hours. The resulting influence over the student's study time – the most crucial opportunity for learning – thus raises the stakes of the learning objectives' affordances. Among the learning objectives' many affordances – consensus-perpetuation, systematicity-building and thingification – the latter merits particular attention, if for no other reason that it is the least understood of the three. How learning objectives afford thingification can be understood through comparison of a medical school learning objective and an elementary school exercise. The comparison of pedagogical forms from two vastly different levels of education is not unfounded as the success of the medical education reform effort, completed by the 1920's, was contingent upon the strength of

primary and secondary education systems. Without a suitably well-prepared pool of applicants, the rigorous standards of the new medical education system could not be implemented. To the extent that the "new [medical education] system fostered a narrowing of medical schools' interests to issues of technical concern," a burden fell on primary and secondary school systems to devise similarly narrowing strategies (Ludmerer 25). A critique from *Education, Modernity and Fractured Meaning* by Donald W. Oliver and Kathleen Waldron Gershman emphasizes what such technical narrowing might look like at a primary school level in a typical second-grade level assignment (Figure 20):

Figure 20: First grade assignment given in Education, Modernity and Fractured Meaning


Name _____

Read the story.

Last June I planted my seeds. A long green vine grew. Orange flowers grew on the vine. Each flower will become a pumpkin. I can give pumpkins to my friends.

Read the sentences below. Cut them out and paste them in the right order.

1	Then orange flowers grew.	3
2	A long green vine grew.	2
3	The flowers will be pumpkins.	4
4	I planted some seeds.	1
5	I will give pumpkins away.	5

Cut.

In their critique of this assignment, Oliver and Gershman write that the assignment's purpose is "to teach the child to order temporal events" while pointing out that:

> The child has most likely never participated in these events (planting pumpkins, watching the flowers turn into pumpkins). The child is not encouraged to hold a pumpkin, to feel a pumpkin, to feel like a pumpkin. There is no effort to present the mystery of birth and life and death and rebirth involved in the five-line story. The story could be a drama; it could

> be visual; it could have smell and taste. It could be a dance. The kinds of participation in 'pumpkinhood' are even more plausible given its association with feasting (Thanksgiving) and the mystery of the spirit world (Halloween). Yet here it is used in a very isolated way to teach children how to order give events in an abstract series. The consequence of understanding this order has little to do with eating or celebrating. It has only to do with how a student tests on something called verbal comprehension, a 'skill' which will presumably allow him or her to interpret technical information and cope in a highly verbal abstract culture. (Oliver and Gershman 184)

Isolated from the mysterious, evocative "it-ness" of pumpkins themselves, along with any engagement of the imaginative or mysterious potential to which pumpkins grant access, the five-sentence story is fragmented into five cut-out pieces, altogether affording a clear test of chronological reasoning, a component of verbal comprehension. The content of the chronology is irrelevant as long as it does not interfere with assessment: pumpkins could be just easily swapped for watermelons provided the cultivation of verbal comprehension is not affected. The irrelevance of content helps foreclose participation in what the authors whimsically call pumpkin-hood, which falls under the category of what they call ontological knowledge, or a deep engagement with being.

Many levels of education later, the UICOM learning objectives enact the same technical isolation that forecloses ontological knowledge and helps cultivate intellectual tchotchke. Most of the learning objectives are written as imperatives, always beginning with verb in the form of a command. Some exceptions include a more descriptive phrase wherein the verb is not conjugated as an imperative, but rather left in the infinitive, as in "the student will be able to…" Defining 'learning objective' to be any material following either of these two verbal 'stems,' there are five

separate "sub"-learning objectives in following UICOM learning objective taken from cardiac physiology, which as a unit deals with blood pressure and the practical concerns of measuring it:

> Describe (implied direct) blood pressure measurement with a catheter and transducer and explain the components of blood pressure waveform. Contrast that with the indirect estimation of blood pressure with a sphygmomanometer. Explain how each approach provides estimates of systolic and diastolic pressures. Given systolic and diastolic blood pressures, calculate the pulse pressure and the mean arterial pressure.

There are five instances of the imperative tense, but only four different infinitives: describe, explain (used twice), contrast and calculate. The imperatives call for action: the student must act in the way particular verb describes with regard to the material that follows in order to demonstrate competence and perform well on exams. In the case of three out of the four infinitives, however, there is an abundance of ways to do 'description,' 'explanation and 'contrasting.' Description can be a list – (first, you take the blood pressure cuff; second, you…) – whereas explanation can be a narrative. Contrasting imposes a more circumscribed set of actions as it implies a balancing act between the two entities that follow. The multiplicity of ways to do description, explanation and contrasting notwithstanding, there is no accounting for the anxiety that the particular action the student chooses has not captured all that will enable her to successfully answer a question on an exam. In the case of the final verb – calculate – it is almost certain that it captures little. Like verbal comprehension, calculating pressures is a skill that will presumably enable medical students to interpret medical data and to cope in medicine's complex numerical culture. However, unless the exam question provides the systolic and diastolic blood-pressures in the question stem and does not introduce any novelty to the situation, the student who merely follows the imperative to calculate in the course of his preparation will be more likely to answer the question incorrectly, or,

at the very least, will not learn all that he could about the equation. For merely focusing on the equation's use in calculating numbers, which, to be sure requires skill, nevertheless enacts isolation from 'equation-hood.'

The ostensible given-ness of equations sets up the phrase 'equation-hood' to be met with scorn or a scoff. Nevertheless, Linda Costanzo's *Physiology* textbook – both the unofficial textbook used in UICOM M1 physiology course and a canonical physiology textbook in its fourth edition – rescues equation-hood from the learning objective's technical isolationism by presenting the MAP equation as capable of being read and interpreted, which is to say, capable of being 'participated in' as is possible with a novel or poem. Given Costanzo's educational background, it is not unfitting to envision her work through a literary lens. During her undergraduate years at Duke University, Costanzo admits "her loyalty was torn between two of her best subjects, chemistry and English" (Robertson). To assume that the 'hard, scientific' path won out over the 'soft, humanities path' would obscure her status as the author of a celebrated scientific textbook, one that affords a more rigorous and profound engagement of the material than that afforded by the learning objectives. In contrast to the learning objective's emphasis on calculation, which narrows the MAP equation to number-producing thing, Costanzo's treatment of the MAP equation given in Figure 21 presents it as a text that merits contemplation:

Figure 21: Close-reading of the MAP equation from Costanzo's Physiology

- **Mean arterial pressure** is the average pressure in a complete cardiac cycle and is calculated as follows:

  Mean arterial pressure
  = Diastolic pressure + 1/3 Pulse pressure

  Notice that mean arterial pressure is not the simple mathematical average of diastolic and systolic pressures. This is because a greater fraction of each cardiac cycle is spent in diastole than in systole. Thus, the calculation of mean arterial pressure gives more weight to diastolic pressure than systolic pressure.

Costanzo's chosen imperative – "notice" – initiates her close-reading of the equation. Moreover, her close reading is a formal one. It says that the equations does not simply adopt the form of the mathematical average, but produces a variation on it: by shifting more weight to one term than the other, the equation exists in formal compatibility with data from a basic physiological rhythm, namely, the pattern of the heart spending more time relaxing and filling with blood than contracting and pushing blood out. Reading the equation as Costanzo does arguably creates a deeper engagement with physiological concepts than the UICOM learning objective's imperative to calculate mean arterial pressure with a set of systolic and diastolic data. Whereas the learning objective sets up a basic 'plug and chug' task whereby the student simply plugs the data to the equation qua number-crunching thing, the engagement with equation-hood afford by Costanzo's noticing and reading the equation constitutes an intellectual task far superior to the exercise of elementary mathematical skills.

Even more surprising than the revelation that engaging with equation-hood is a more efficacious way of studying than the task prescribed by the learning objective, Costanzo's reading of a second version of the MAP equation (Figure 22) imbues it with two additional literary qualities that convention would say does not apply to mathematical expressions. To be sure, the second

MAP equation appears nowhere among in the learning objectives, which is to say, the second MAP equation lies outside the consensus reached by the UICOM curriculum committee that determined what constitutes the central material of a UICOM medical student's education.

Figure 22: Close reading of the second version of the MAP equation from Costanzo's Physiology

The mechanisms that help to maintain P_a at a constant value are discussed in this section. The basis for this regulation can be appreciated by examining the equation for P_a:

$$P_a = \text{Cardiac output} \times \text{TPR}$$

where

P_a = Mean arterial pressure (mm Hg)
Cardiac output = Cardiac output (mL/min)
TPR = Total peripheral resistance (mm Hg/mL/min)

Notice that the equation for P_a is simply a variation of the familiar equation for pressure, flow, and resistance, used previously in this chapter. Inspection of the equation reveals that P_a can be changed by altering the cardiac output (or any of its parameters), altering the TPR (or any of its parameters), or altering both cardiac output and TPR.

Like her reading of the first MAP equation, Costanzo uses the imperative, "notice," to call attention to formal variation. Indeed, she seeks to underline how the second MAP equation is differently the same from the archetype equation for pressure: Pressure = Flow x Resistance. Mean arterial pressure serves as the 'Pressure,' whereas cardiac output serves as 'Flow' and Total Peripheral Resistance serves as 'Resistance.' By her call for further "inspection" of the equation, Costanzo elucidates a potentially disconcerting dimension of equation-hood: deception. The idea that mathematical forms would deceive flies in the face of any attempts to make it the bedrock of science. As Costanzo explains, however, the deception is generated by strict adherence to algebraic law: "be aware that this equation is deceptively simple, because cardiac output and TPR are not independent variables. In other words, changes in TPR can alter cardiac output and changes in

cardiac output can alter TPR" (Costanzo 159). In order to avoid misusing the equation, the equation has to be read in a way that the technical-oriented learning objective does not prescribe. The distinction between what the learning objective says and does not say corresponds to hard and soft cognitive styles, respectively.

4.3.3 Textbooks: The Hard-soft in research

Though textbooks are perhaps most readily regarded as texts that govern pedagogy, the influence of textbooks when conceived as a function of how much time medical students actually spend reading and engaging with them is surprisingly limited. The relentless pace of medical school makes the actual reading of textbooks, for better or worse, an inefficient way of learning information. The more impactful, if underappreciated role they serve is to consolidate the paradigms governing scientific research. In this way, medical textbooks could be said to say more about the state of the field from which they emerge than the student audience for whom they are written. If the 'raw' material from which textbooks are drawn derives from journal articles, then textbooks synthesize and consolidate what journal articles produce. The reference section of textbooks attests to the debt they owe to journal articles. The selection and synthesis of article-presented research arguably enacts the relationship that Thomas Kuhn claims textbooks share with scientific paradigms. Textbooks, Kuhn declares, "address themselves to an already articulated body of problems, data, and theory, most often to the particular set of paradigms to which the scientific community is committed at the time they are written" (Kuhn 136).

Kuhn goes on to describe one of the formal features of textbooks that holds particular paradigmatic relevance: short histories of the knowledge production to which the given textbook owes its existence. Often, these histories take the form of "scattered references to the great heroes

of an earlier age" (138). These historical sketches are relatively rare in textbooks and when they do appear, they cannot help but stick out from the disciplinary knowledge with which the textbook is concerned. As such, they will likely not rank highly on the student's list of priorities seeing as there would be little chance of it appearing on an exam. The rarity and seeming irrelevance of historical sketches thus raises the question of why they even exist in the first place. Kuhn offers an explanation, writing, "partly by selection and partly by distortion, the scientists of earlier ages are implicitly represented as having worked upon the same set of fixed problems and in accordance with the same set of fixed canons that the most recent revolution in scientific theory and method has made seem scientific" (139). A situation in which a number of esteemed thinkers sets about to working out a common problem gives the impression of an enterprise that is "linear and cumulative," a robust, satisfying narrative that helps consolidate the paradigm to which the textbook addresses itself (139).

Costanzo's *Physiology* textbook includes a description of one such situation in the chapter on cardiac physiology. The section where it appears is entitled "Frank-Starling Relationship" and its overt pedagogical function is to situate a crucial concept of cardiac physiology – the length-tension relationship – with respect to three cardiac parameters: stroke volume, ejection fraction and cardiac output. As an introduction, Costanzo explains the lineage of the titular Frank-Starling Relationship:

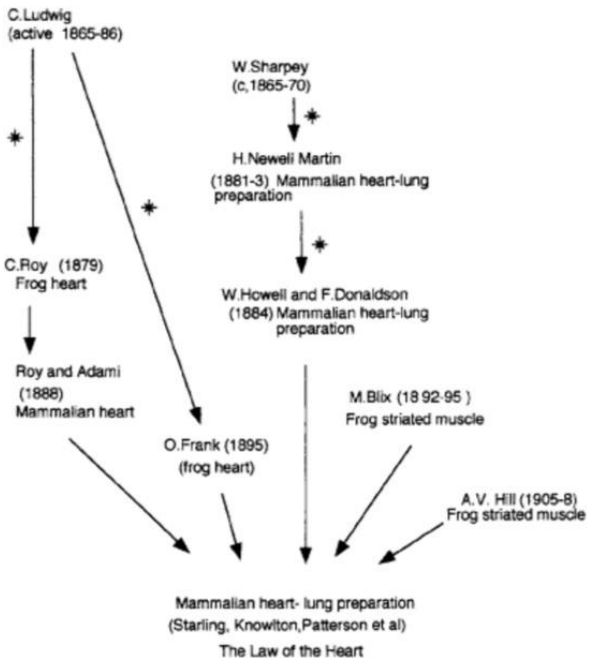
> The German physiologist Otto Frank first described the relationship between the pressure developed during systole in a frog ventricle and the volume present in the ventricle just prior to systole. Building on Frank's observations, the British physiologist Ernest Starling demonstrated, in an isolated dog heart, that the volume the ventricle ejected in systole was

> determined by the end-diastolic volume. […] The Frank-Starling law of the heart, or the Frank-Starling relationship, is based on these landmark experiments (146).

If attaining the status of law is a veritable disciplinary apotheosis in research and beyond – law being the veritable epitome of hardness and hardness being the state to which all knowledge is supposed to aspire – then Costanzo's description of these past scientific heroes makes the ascent to disciplinary greatness seem linear and cumulative. As Kuhn predicts, the linearity and cumulation of this ascent is the product of both selection and distortion. With the fullest appreciation for the pedagogical efficacy of Costanzo's literary background, her textbook's historical sketch of the Law of the Heart indeed commits the selective and distortive historical errors that Kuhn posits for textbooks. These errors include: 1) oversimplifying the network of intellectual exchange of which Starling and Frank were a part 2) omitting the linguistic obstacles that might have prevented the necessary intellectual connections that led to the formation of the Law of the Heart 3) underestimating the disciplinary differences between Frank and Starling 4) failing to register for the paradigmatic differences under which Starling conducted his research and under which she wrote her textbook.

Beginning with the first of these four errors, the emphasis on the work of merely two scientists Frank and Starling – consequential as both were in articulating the "Law of the Heart" – nevertheless represents only a small sample from a large pool work that has epistemological connections to the law of the heart. A schematic from John Henderson's *A Life of Ernest Starling*, part biography, part history of science, details the complex lineage of the law:

Figure 23: The lineage of the law of the heart given in A Life of Ernest Starling *(pg. 81)*



Taking the schematic face value, no fewer than eleven figures made contributions to the Law of the heart. Perhaps more importantly, the law derives from no fewer than ten different relationships, (denoted by arrows), of which four were student-pupil (denoted by stars). But even as it complicates the lineage of Starling's heart-lung preparation and forestalls the ludicrously simple proposition that Starling merely picked up where Frank left off on single strand of scientific experimentation, the schematic still exhibits the linearity and cumulation for which Kuhn specifically targets textbooks: the visual organization of the diagram shows the work of the various scientists *converging* on the Law of the Heart. In this way, Henderson's philosophy of science still practices the retrospective teleology of which Kuhn accuses textbooks. The sense of inevitability afforded by converging arrows is just another form of distortion created by the selective reduction of a major law to the work of two scientists in Costanzo's sketch.

The second distortion-creating error of Costanzo's historical sketch relates to language and the contingent flow of knowledge across linguistic boundaries. Indeed, Henderson's biography of

Starling further undermines the linear inevitability of Starling taking up the work of Frank by pointing out the linguistic obstacles to fully appreciating and thus, to use Costanzo phrase, "building on" Frank's work. Henderson writes, "Frank's writings – especially his long 1895 paper on the dynamics of heart muscle ["Zur Dynamik des Herzmuskels"] – are in very difficult German, so it is not surprising that they had escaped many English-speaking readers" (95). Starling, however, spoke German well, putting him in a position to engage Frank's work without translation. Yet the happy and productive coincidence of Starling's competence in German is not what the nationalistic labeling in Costanzo's historical sketch most readily suggests. Rather, what can all too easily emerge from these labels is the triumph of scientific discovery: national boundaries do not hinder the transcendence of national boundaries to which scientific progress is privy. Such thinking is very much in the tradition of Friedrich Schleiermacher, who posits the scientific process as the ideal to which states should strive.[10] However, Henderson's biography suggests that this sense of inevitability is undermined by the contingency of speaking a foreign language. To the extent that "the importance of Starling's achievement lay in his ability to bring all the strands together," it was of paramount of importance that Starling's synthesizing mind also spoke the language by which he could access one such strand, which is to say, Frank's work in the original (82).

Of course, the importance of Starling's bilingualism could be discounted by pointing out how English translations of Frank's work would render German language competence unnecessary. This position, however, fails to recognize that translations were not as readily available during the early twentieth century in which Starling was writing. Indeed, the benefits of engaging Frank's work in the original language and, conversely, the loss associated with Starling

[10] See introduction to this dissertation

not having spoken German, is hinted at by a 1915 paper entitled "The Regulation of the Heart Beat." Written by Starling in collaboration with two other scientists, S.W. Patterson and H. Piper, the paper features numerous references to Frank's work, one of which refers to technical vocabulary in German:

> Although the conclusions to which we have arrived differ somewhat from those of Straub, we found the knowledge of his results of considerable value. In his paper he gives the same description of the reaction of the heart to increased arterial pressure as that given by Frank for the frog's heart, namely, as a reaction to initial tension (Anfangsspannung), an explanation which we regard as true only in so far as the initial tension determines initial length (Patterson, Piper, & Starling 475).

Though it is impossible to know the reason for the trouble presumably taken by Starling and his co-authors to include the German term for "initial tension," the side-by-side placement of the two terms in the text nevertheless gestures to the consequential role that Starling's competence in German played in the creation of the Law of the Heart.

The third distortion-creating error arises Costanzo's description of both Frank and Starling as physiologists, which distorts the subtle disciplinary differences between them. Henderson emphasizes Frank was not strictly a physiologist, but rather "a *biophysicist*: he measured everything – flows, pressures, volumes – that could be measured and recorded data in detail" (80, italics mine). Characterizing Frank as a biophysicist, rather than simply as a physiologist, raises the question of what distinguishes biophysics and physiology. If Henderson's description is any indication, biophysics research constitutes incessant measurements. Starling, on the other hand, was interested less in measurements and more so in connections between physiological systems. It is this interest that led him to develop the heart-lung preparation, which, contrary to Costanzo's

historical sketch, led Starling to derive the Law of the Heart. It is this disciplinary difference, highlighted by Frank and Starling's respective experimental apparatuses, that is lost in Costanzo's historical sketch in which Frank and Starling are characterized as both physiologists. In this way, Costanzo's sketch overstates the linearity of the progress to the Law of the Heart by understating the disciplinary differences between Frank's strict biophysics research and Starling's more integrative physiological approach.

Finally, the paradigmatic situation under which Frank and Starling carried out their respective research projects could not be identical to that under which Costanzo composed her *Medical Physiology* textbook. In the opening sentences of the preface, Costanzo declares in no uncertain terms that "physiology is the foundation of medical practice. A firm grasp of its principles is essential for the medical student and the practicing physician" (vii). It follows that the clinical relevance of everything in the following five-hundred pages is more than assured. Such is the paradigm to which the textbook addresses itself: all the forthcoming material, including and especially the Frank-Sterling Law of the Heart, comprises and fits within the framework that determines medical problems and establishes the range of admissible evidence. It goes without saying that the Law of the Heart had to first exist and then reach the medical community before it could become a part of this medical paradigm. Yet the probability of the latter occurring is much lower than would be expected in view of the Law of the Heart's central place in the veritable foundation of medical practice. As Henderson points out, "Starling's difficult papers in the *Journal of Physiology* would probably have had poor exposure among doctors" (93). Both the difficulty and disciplinary location of Starling's research worked against its integration into medical practice. To be sure, the United States steps were taken to ensure that emerging scientific knowledge reached medical practice – this was indeed one of the central goals of the Flexnerian Revolution.

The entrenchment of the Law of the Heart in a physiology textbook, however, obscures the contingency of this knowledge becoming medically relevant by making it seem like it always belonged there. Indeed, Costanzo's labeling of both Frank's and Starling's work as "landmark experiments" erases the reality that at the time of their creation, there was nothing landmark about them with respect to medical concerns. Much coordination and effort went into connecting Starling's findings to medicine, a connection which was by no means made inevitable by a coherent theoretical framework.

Perhaps the most startling indication of how Starling's research was not, at the time of its creation, situated in a framework that made its connection to medicine inevitable was the fact that Starling faced great resistance to his research. In the 1915 Linacre Lecture, given annually at Cambridge, which Henderson identifies as a key moment that enabled Starling's research to reach a medical audience, Starling chooses the conclusion to address a figure skeptical to his research: the "so-called practical man." The practical man, Starling proclaims, "reproaches" the physiologist for lavishing attention "on things which can have little importance in medicine, for the maintenance of health or the cure of disease" (Starling 26-27). By this proclamation, Starling firmly situates pure research with questions of hardness and paradigm. Formally separated in the Biglan model by different dimensions, they become mutually constitutive when Starling points out that "in physiology, as in all other sciences, no discovery is useless, no curiosity misplaced or too ambitious, and we may be certain that every advance achieved in the quest of pure knowledge will sooner or later play its part in the service of man" (27).

The enactment of the hard patterns by textbooks is in many respects more dangerous than the enactment of the applied-pure patterns in exam questions, EMR's or peer-reviewed journal articles because the oppositions itself is more difficult to witness. Where the applied-pure

enactments allow for the two be next to one another, this is not the case for the hard-soft opposition. If the historical sketch from Costanzo's physiology textbook is any indication, systematic hardness is all there is and ever was. As his biography shows, however, Starling had to work outside of dominant theoretical frameworks about, among other things, what is relevant to medical practice in order to articulate the Law of the Heart. This is not to say, of course, that the work itself is not systematic but that it is perhaps *more* idiosyncratic than the Biglan model prepared to acknowledge in a discipline it would consider hard. In this way, textbooks as well as learning objectives cultivate a dangerous sense of a distinction between hard cognitive styles and a soft cognitive style.

4.4 CONSOLIDATING LIFE-NONLIFE COGNITIVE STYLES: INSTITUTIONAL REVIEW BOARD GUIDELINES, OBJECTIVE STRUCTURED CLINICAL EXAMINATIONS (OSCE'S) AND CULTURAL COMPETENCY TRAININGS

The life-nonlife dimension of the Biglan model relates to the subject matter characteristic of the sentience of the object of study. Institutional Review Board Guidelines, Objective Structured Clinical Examinations and Cultural Competency Trainings have their own patterns of doing life nonlife. In the case of the Institutional Review Board guideline, the patterning is explicitly rendered as questions of living and non-living research subjects. As for the Objective Structured Clinical Examination, the life-nonlife pattern arises by the rendering patients as automata. Finally, cultural competency trainings exhibit life-nonlife patterns insofar as they rely on stable, personal configurations of culture as well as formulaic ways of responding to gross cultural insensitivity.

4.4.1 Institutional Review Board Guidelines: Life-nonlife in Research

The enactment of a life-nonlife cognitive style occurs in a form that governs medical research: Institutional Review Boards (IRB). There are two IRB forms: one for the bio-medical and social-behavioral, the two major categories of research that involve human subjects. The IRB concept extends as far back as the aftermath of World War II, when revelations over the scientific experimentation conducted in concentration camps of the Third Reich prompted the codification of concerning human experimentation. The subsequent importance of IRB system in governing medical research cannot be underestimated: besides granting ethical seal of approval from a researcher's home institution, IRB status is bound up in funding, being a criteria of grant proposals, including that of the NIH.

The IRB equivalent at the University of Illinois Urbana-Champaign, also known as the Office of Protection for Research Subjects, boasts numerous forms for its researchers to consult, including a glossary of terms. One of the terms, human subject, has three entries given below:

Figure 24: Three definitions of the human subject given by the Office of Protection for Research Subjects

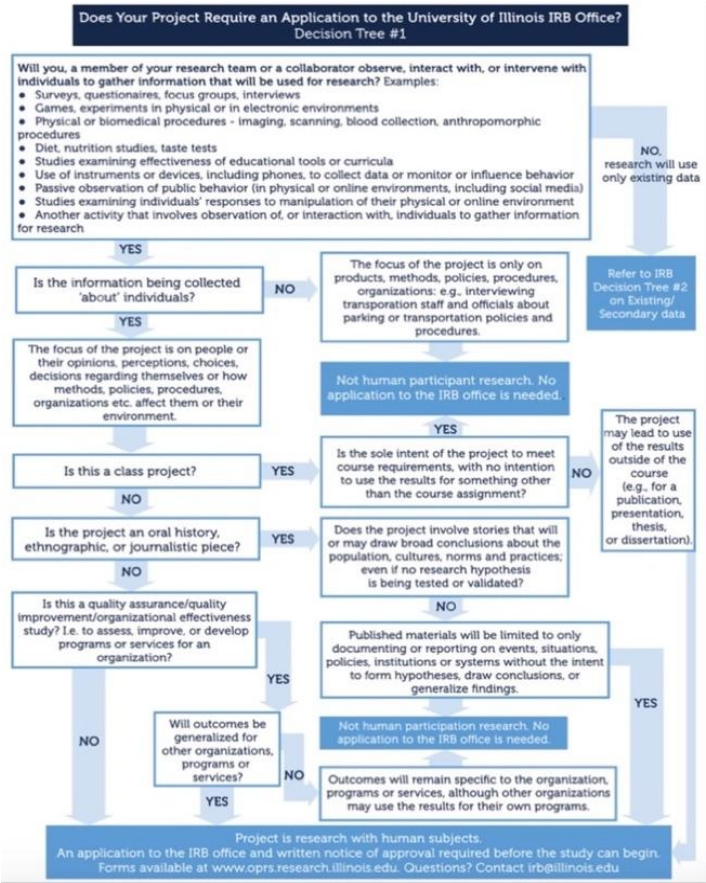
Human Subject	A living individual about whom an investigator (whether professional or student) conducting research obtains: 1. Data through intervention or interaction with the individual, or 2. Identifiable private information. *Human Subject Research as defined by DHHS regulations*
Human Subject	An individual who is or becomes a subject in research, either as a recipient of the test article or as a control. A subject may be either a healthy human or a patient. In the case of a medical device, a human subject/participant also means a human on whose specimen an investigational device is used. *Human Subject Research as defined by FDA regulations*
Human Subject	The term human subject means a living individual about whom an investigator conducting research obtains data through intervention or interaction with the individual, or obtains individually identifiable, private information.

For the first and third definitions, life is the crucial linchpin, "living" being the crucial participle modifying "individual" in both cases. As in the Biglan model, these forms take the meaning of

"living" to be self-evident, thereby seemingly absolving the matter from further consideration. There is indeed no entry in the glossary defining life or living, just as is the case with the Biglan model.

A slightly more indicative glimpse at what living means for IRB purposes instead occurs in another set of documents provided by the Illinois IRB: "decision-trees" that help researchers determine whether their research requires IRB approval. As a form, the decision tree can be taken as a visual algorithm, beginning with an initial query that branches into choices, which in turn lead to further queries and further choices. Eventually, the algorithm bottoms out, producing one of two results: IRB approval is required for the research or it is not required.

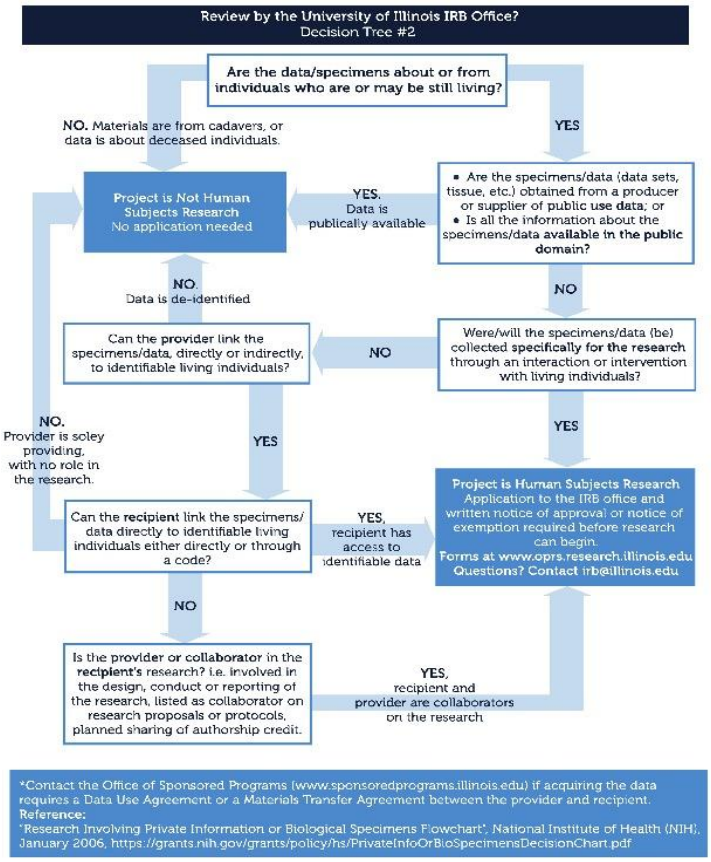
Figure 25: Decision tree 1 from Illinois IRB Office



The initial query of the first decision tree given above in Figure 25 is "Will you, a member of your research team or a collaborator observe, interact with, or intervene with individuals to gather information that will be used in research?" Branching off from this query is a choice between 'YES' or 'NO.' The 'YES' pathway snakes around and will bottom out in one of two results: "Not human participation research. No application to the IRB office is needed" or "Project is research with human subjects. An application to the IRB office and written notice of approval required before the study can begin." The 'NO' pathway, on the other hand, bottoms out with "Refer to IRB Decision tree #2 on Existing/Secondary data." The division established by the necessity of IRB approval enacts a crucial patterning onto which the Biglan model's life-nonlife distinction maps moderately well. Whether in an applied-hard discipline like medicine, a pure-soft discipline like anthropology or an applied-soft discipline like family studies, researchers in life disciplines must invest considerable time and effort to merely get permission to conduct their research, a burden with which researchers in nonlife disciplines are not often saddled. Of course, there are numerous exceptions on both sides of this ostensible divide: an ethnomusicologist, though working in the nonlife field of music, might need to obtain IRB approval to study urban street music whereas a political scientist avoids IRB approval by virtue of the theoretical nature of her work in a discipline nevertheless classified as a life field. With these complications in mind, the necessity of obtaining IRB approval mediates a crucial disciplinary difference by establishing a gap between research that requires approval and that which does not. Whether that gap is situated by a classic Biglan life-nonlife opposition is unclear.

However, the disciplinary difference enacted by the first decision tree becomes classically life-nonlife in the second decision tree, which researchers will consult if they take the 'NO' pathway branching out from the first decision tree's initial query:

Figure 26: Decision tree 2 from Illinois IRB Office



The second decision-tree begins with the query: "Are the data/specimens about for from individuals who are or may be still living?" From this, there are the same two paths: YES or NO. That this mutually exclusive decision point rules on the question of life is indisputable considering that "materials are from cadavers or data is about deceased individuals" accompanies the 'NO' pathway (see Figure 26 above). The second decision tree thus does an undeniable life-nonlife opposition by making the question of life or living an either-or proposition: there are either corpses or living persons, a pattern that in turn calls for two distinct cognitive styles.

4.4.2 Objective-Structured Clinical Examination (OSCE): Life-nonlife in Medical Education

The prominence of written medical school exams can overshadow the existence of exams that test clinical skills in real time. In these real time exams, the examinee interacts not with a series of test-questions but with a person. Both exams formats punctuate medical education. STEP 2, the second round of USMLE board examinations, itself consists of both formats, exhibiting a clinical knowledge (CK) component and a clinical skills (CS) component. STEP 2 CK resembles STEP 1 in that it is comprised of several hundred multiple choice questions, the key difference being that STEP 2 tests fewer basic science principles and more clinical questions. STEP 2 CS, on the other hand, consists of eight 60-minute blocks during which the examinee must complete all of the standard tasks of medical interviewing, including taking a history, conducting a physical examination and writing up a patient note. The individual blocks of which the STEP 2 CK is comprised each constitute an objective structured clinical examination (OSCE).

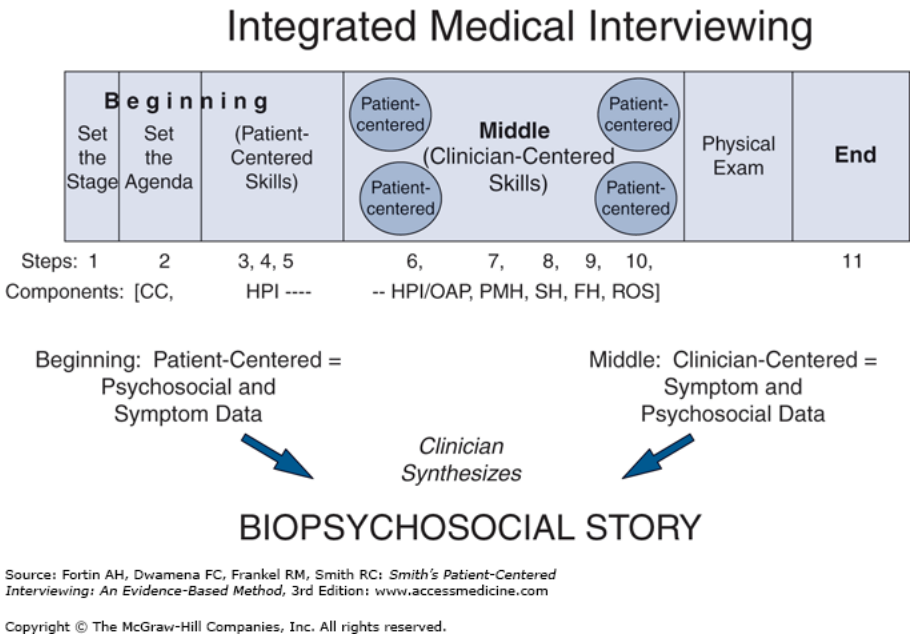
The OSCE first appeared in the mid 1970's and replaced traditional assessments of clinical competence, which possessed many perceived disadvantages. The seminal 1975 article that inaugurated the OSCE, "Assessment of Clinical Competence using Objective Structured Examination," lists two:

1) Confusion over what is being tested: As clinical competence includes but is not limited to eliciting and charting a history, performing a physical examination, ordering further testing, arriving at a diagnosis and forming a treatment plan, there can be considerable confusion over which combination of these tasks is being tested in an exam situation.
2) Luck of the draw: Conducted in the hospital setting, the traditional clinical assessment was reliant on the patients who happened to walk through the door that day. As such, there was considerable variability over such factors as the complexity of the physical

complaint itself, to say nothing of the individual patient's primary language, level of health literacy, or mood, among countless other factors. This multi-factorial situation flies in the face of the basic scientific value to rigorously control variables (Harden et al. 448).

One of the ways the OSCE addresses the first problem is to break each encounter down into discrete tasks. When the task is to elicit and chart a history, the OSCE and the electronic medical record (EMR) participate in a formal cross-breeding whereby the EMR categories structure the rhythm of the medical encounter, as Figure 27 demonstrates below. The pictured schematic of integrated medical interviewing from *Smith's Patient Centered Interviewing* – the official textbook of the UICOM Foundations in Clinical Medicine course and a noted medical interviewing textbook in its third edition – ideally consists of a linear beginning, middle and end during which patient-centered skills (e.g. storytelling) and physician-centered skills (e.g. questioning) alternate:

Figure 27: Schematic for integrated medical interviewing Given in Smith's Patient Centered Interviewing CC= chief complaint, HPI= history of present illness, PMH = past medical history, SH = social history, FH = family history, ROS = review of systems:



Source: Fortin AH, Dwamena FC, Frankel RM, Smith RC: *Smith's Patient-Centered Interviewing: An Evidence-Based Method*, 3rd Edition: www.accessmedicine.com

The synthesis in an OSCE of a biopsychosocial story promised by the *Smith* integrated interviewing schematic, or any other clinical encounter, is unlikely. In view of how the EMR categories rigidly cordon off social history from the biologically-oriented categories of chief complaint, past medical history, review of systems and family history, not to mention the sloppy organization of AthenaNet's FH described in the earlier discussion of EMR's, the effort and time required to integrate the necessary information to arrive at a cohesive 'biopsychosocial story' is greater and hence integration is less likely. Moreover, the only real place for emotion and other psychological data in EMR is in the HPI and possibly a psychiatric section in the Review of Systems.

At whichever point emotion emerges in the medical interview, if it emerges at all, a memory device given by *Smith* supports the process of responding to or managing the emotional content of clinical encounters. Compared to the twelve-word mnemonic for the names of the twelve cranial nerves, along with numerous other mnemonics for the content tested on written exams, the memory device for emotion – NURS – is considerably shorter and simpler, enough so to be distinguished as an acronym, being a single utterance with letters corresponding to proper words rather than an entire sentence. In the case of NURS, the words signified by the letters are actions that the physician can choose to exercise when emotion arises: naming, understanding, respecting, supporting. Moreover, if NURS affords a standardized and rigid approach to emotional context in the medical interview, it is an approach that nevertheless "fits with" the standardized and rigid emotional content that the medical student must elicit from their standardized patients in OSCE's.

To understand how acronym and the emotional content of OSCE's fit together, the standardized patient itself must be more clearly articulated. The image of what standardized

patients must be for the purposes of the OSCE emerges through a description of virtuality in medical education:

> virtuality not only replaces reality (a "reversal"), but we are seduced by it. Hyperreal television wildlife programs are more natural than nature; pornography is more sexual than sex […] Simulated medical education is more real than live learning – in resuscitation scenarios, Sim Man, Sim Woman, or Sim Baby must *not* be allowed to die. (Bleakley and Bligh 378)

If virtuality is seductive replacement, the entity that does the replacing, or plays the role of replacement in OSCE's is the standardized patient. In the effort to standardize the clinical conditions under which students are tested and thus eliminate the second major drawback with traditional clinical examinations, the standardized patients follow scripts, which, among other functions, seductively replace emotion.

Glimpses of how the scripts do this seductive replacement emerge through the OSCE grading rubrics, the forms of written feedback given to students indicating their performance in meeting the sort of discrete clinical objectives that will be tested on STEP 2 Clinical Skills. Therefore, in preparation for STEP 2 CS, feedback may be administered from the very beginning of medical school, as was the case at the University of Illinois College of Medicine. OSCE's in fact comprised the core grading component of the 2017 Foundations of Clinical Medicine (FCM) course, the sole clinical exposure in the M1 curriculum dominated by didactic lectures and other forms of book learning. The grading rubric for this case consisted of 14 items, some of which, like question item 1, contain as few as 5 sub-items (e.g. item 1a, 1b, 1c, 1d, 1e) or as many as 16 sub-items, as with item 12 (e.g. 12a – 12p). Each item corresponds to a piece of information that the

student must record in his or her chart in order to receive full credit. Item 8, given in Figure 28 below, involves the emotional context of the illness:

Figure 28: Item 8 from an FCM grading rubric

8	Obtained the personal/emotional context of illness - "I have not been able to walk the dog or play golf due to the cough which gets worse in the cold". S/he has been tired and can't focus at work. S/he has not had any problems with asthma for 2 years and is wondering if s/he is having an asthma attack due to the wheezing.			X

Unlike most of the other items of the grading rubric, this item features direct quotations, presumably lifted directly from the standardized patient scripts.

Thus, the acronym-reliant technique of managing emotion and what the OSCE requires emotion to be go together. There is a formal compatibility between them: a compact, emotion supporting acronym like NURS goes with a scripted expression of emotion. In this way, the OSCE exhibits a life-nonlife patterning wherein unpredictable events like emotional expression can be managed and contained by handy, yet lifeless mnemonics. The OSCE's enactment of life-nonlife fragmentation is thus closer to the learning objective's enactment of the hard-soft; just the hardening of thingification brings the soft into existence as its compulsory other while keeping the soft obscured, so too does the nonlife virtuality of the simulation bring life into existence as its compulsory other while indicating nothing about what life is.

By virtue of these scripts, the OSCE forces the patient into an automaton that replaces reality: when student feeds questions, they invariably receive certain information from the patient, which nurtures the expectation that this will always be the case. This guarantee constitutes the seductive replacement of emotion. The exigencies of the OSCE demands that the standardized patient volunteer the information if the question is asked, for this information must be present in the written history in order to receive credit. In the event that the standardized patient was to purposely withhold or forget information, as patients might in so-called real life, they would thwart

the pedagogical objectives of the examination. Nevertheless, the transformation of patient into automaton for the purposes of the OSCE generates the seductive force that characterizes virtuality. In this virtual space, there are non-life automata that nonlife cognitive style that opposes itself against a categorical other, a life cognitive style.

4.4.3 Cultural Competence Trainings: Life-nonlife in Patient Care

Cultural competence is often cited as the Flexnerian enterprise's answer to the challenges put forth by questions of the socio-cultural determinants of health and health disparities between various demographics. As with the medical humanities, the health humanities, the arts and medicine, these terms – cultural competence, health disparities, social determinants of health – often overlap in confusing ways and can refer to a variety of different projects. One of, if not the only, binding thread is that they seek improvement in patient care and health outcomes, rendering anything under these broad rubrics inherently clinical projects. The clinical further raises the stakes of these interventions and any potential problems with them.

One particularly trenchant criticism of these projects challenges their reliance on "stable cultural norms or predictable culturally based behaviors where none exist" (Gregg and Saha 543). In this way, the great lifelike force of culture joins the fate that biology suffered with the creation of the Flexnerian curriculum. Affixing culture to competence enacts the presumption that culture can be comprehended and mastered like any of the other material of medical curriculum in which students and practitioners must achieve competence. In this way, competence does to culture what learning objectives do to the standard scientific material of biomedicine: thingification. With thingification comes an inflated sense of mastery, the extreme and unwanted version of what the use of the comparatively humbler word, 'competence,' strives for. Writing on the difference

between cultural competence and what they call cultural humility, Tervalon and Murray-García demonstrate by way of personal anecdote the misleading, and, in this case, clinically dangerous confidence afforded by cultural competence that relies on thingified culture:

> To be avoided […] is the false sense of security in one's training evidenced by the following actual case from our experience: An African American nurse is caring for a middle-aged Latina woman several hours after the patient had undergone surgery. A Latino physician on a consult service approached the bedside and, noting the moaning patient, commented to the nurse that the patient appeared to be in a great deal of postoperative pain. The nurse summarily dismissed his perception, informing him that she took a course in nursing school in cross-cultural medicine and 'knew' that Hispanic patients over-express "the pain they are feeling." (Tervalon and Murray-García 118-119).

As first letters stood for the names of the cranial nerves in the cranial nerve mnemonic, so does "Hispanic," for the nurse, stand for "over-expression of pain." How this tchotchke understanding of cultural difference became so solidified as to seduce the nurse into allegedly ignoring signs of pain in her patient is multi-factorial, being a combination of the materials used in her cross-cultural medicine, the manner of instruction, the learner herself, the overall learning environment and the like. Examining the role of one of these factors – cultural competence materials – leads to the revelation that materials used to train cultural competence do indeed afford the thingification of culture, which, in turn, presupposes a nonlife cognitive style opposed against a life cognitive style.

One such set of materials is "A Physician's Practical Guide to Culturally Competent Care," an interlocking 9-part video module series developed by the U.S. Health and Human Services' Office of Minority Health. Though asserting this video series figured among the materials that the anonymous nurse encountering in her cross-cultural would amount to pure speculation, the series

does serve as the cultural competence training for the intake volunteers of Avicenna Community Healthcare Clinic – a multi-cultural facility in Champaign, Illinois that serves immigrant populations and receives much of its funding and support from the Central Illinois Mosque and Islamic Center. The stakes of cultural competence training are thus particularly high for Avicenna; as such, the likelihood that its choice of the HHS modules is an expression of honest dedication to cultivating cultural competence is perhaps greater than the likelihood that it is merely lip service to the diversity and cultural issues, as is perhaps the case at some health care facilities. Despite honest intentions, however, the choice of these material for cultural competence training is highly questionable.

One problem with the series is that what exactly makes it a "practical" guide is unclear; if the pure-applied dichotomy is insisted upon, the series is perhaps more of pure cataloging of various races, problems-posed and the various ways medical personal might deal with those problems. Broken down into three parts, each with three sub-parts, the series indeed traces the members of a single medical practice as they witness and confront 'culture' in the everyday business of running the clinic. The first two sub-parts of each module dramatize physician-patient interactions involving a single ethnical minority patient. Table 3 schematizes the structure:

Table 3: The Physician-patient interactions of "A Physician's Practical Guide to Culturally-competent care"

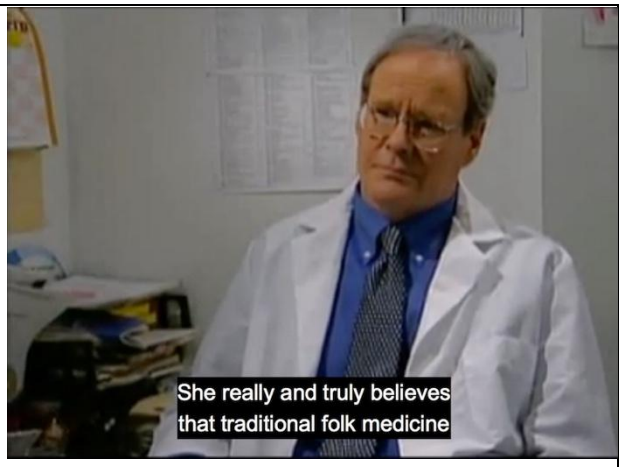
Module	**Patient Ethnicity**	**Problem(s)**
1.1	Hispanic	Language barrier; accidental overdose
1.2	Native American	Non-compliance; fear of dying in a hospital
2.1	Vietnamese	Language barrier, faulty translation by a family member; refusal of treatment
2.2	Hispanic	Culture-bound syndromes (*ataque de nervios*)
3.1	Black (Ethiopian)	Socioeconomic status; health literacy
3.2	Black (African-American)	Socioeconomic status; health literacy

The module-level structure of the series helps provide an answer to the often overlooked, yet fundamental question in cultural competency materials about the relationship between race or ethnicity and culture. If this structure schematized in Table 3 is any indication, race or ethnicity constitutes the basic organizational units of cultural competence: physicians learn cultural competence along the lines laid down by conventional racial or ethnic categories. The use of conventional racial categories in turn risks deployment of conventional race-problem pairings as well. The reification of these categories by this, the module-level structure of the training video, contributes to the work of thingification: following the video, the black patient is the patient who is health illiterate; the Hispanic patient is the patient who cannot speak English.

A particularly evocative thingification of culture occurs in Module 1.2. The patient in this module is a Native American woman with Type II diabetes named Geraldine Williams. Geraldine resists taking her medication and instead insists on receiving traditional therapy from the Arizona community into which she was born. Returning from a 6-month retreat, she meets with her skeptical physician Dr. Brown to discuss conventional treatment options. In the climax of the

module, Geraldine expresses her belief in traditional folk medicine while Dr. Brown is thinking to himself how it could be the case that she could really believe in its efficacy (see Figure 29 below).

Figure 29: Thingification of Culture from "A Physician's Practical Guide to Culturally-competent Care"

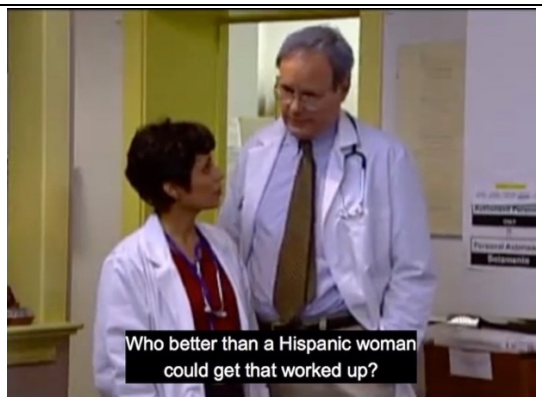
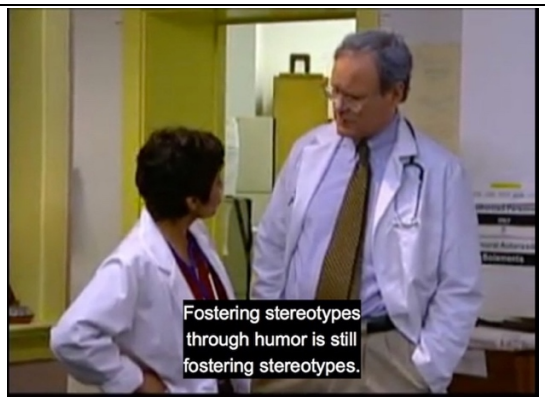
	
Time Mark: 2:20	Time Mark: 2:23
Screenshots from Module 2.2 of "A Physician's Practical Guide to Culturally-competent care". The sub-titles of the first screenshot are spoken by Dr. Brown (left) whereas the sub-titles of the second screenshot are spoken by Dr. Rivera (right).	

Characterized by exaggerated expressions and mannerisms, the image of a Native American woman who is non-compliant functions as a tchotchke figurine like those pictured in Figure 29 above. Like material figurines, the example of Geraldine, along with the other patients in the cultural competence trainings, help constitute the conceptualization of salient, constant behaviors that can in turn apply in a variety of situations.

Figure 30: Culture as a set of tchotchke figurines

In addition to making cultural tchotchke, the cultural competence materials also accomplish thingification of *competence*. An example of this process occurs in Module 2.2 when Maria Gonzalez –the mother of Arturo Gonzalez, the patient from Module 1.1 – demands to see the practice's only Spanish-speaking or female physician, Dr. Rivera. In a conversation about Mrs. Gonzalez, Dr. Rivera and her colleague, Dr. Brown, get into an argument about cultural stereotyping. Predictably, Dr. Rivera emerges, as in the previous modules, as the culturally competent figure who must teach her culturally incompetent colleagues a lesson. Figure 31 below shows two screenshots capturing what could be characterized as the pedagogical climax of their argument:

Figure 31: Thingification of competence from "A Physician's Practical Guide to Culturally-competent Care"

	
Time Mark: 0:58	Time Mark: 1:12
Screenshots from Module 2.2 of "A Physician's Practical Guide to Culturally-competent care". The sub-titles of the first screenshot are spoken by Dr. Brown (left) whereas the sub-titles of the second screenshot are spoken by Dr. Rivera (right).	

The face-value objective of the encounter is to discourage the utterance of statements like "Who better than a Hispanic woman could get that worked up?" by inculcating the realization that no matter their delivery or the intention behind them they invariably "foster stereotypes" (Office of Minority Health). Using the video to elaborate on what fostering stereotypes actually is, stereotypical utterances could constitute pairings of a readily available categories – i.e. Hispanic and woman – with an idiom for, say, flustered behavior – i.e., getting worked up. Both category and idiom are ready-made and, by dint of incessant pairing, seem to go together, providing the cheap raw material for assembling tchotchke-like assessments of situations. By Dr. Rivera's response, the video works to discourage such assembly, giving the impression that the training module serves the moral framework to which cultural competence answers. Such would be the obvious intended result of cultural competence training video. However, the utterance of a phrase by Dr. Rivera that is meant to show cultural competence – "Fostering stereotypes through humor

is still fostering stereotypes" – is no less formulaic than "Who better than a Hispanic woman could get that worked up?" the very comment demonstrates cultural incompetency.

Incidentally, the manner whereby Martin's racism comes to the fore in *Arrowsmith* is formally similar to the plots of the cultural competence training video whereby Dr. Brown makes demeaning remarks about Mrs. Gonzalez. That Arrowsmith would deal with issues of race in medicine several decades before it would become a talking point in medicine attests to the theoretical prescience of imaginative works. For the majority of *Arrowsmith*, there is virtually no indication of the need for something like cultural competence in clinical practice. As such, there could be no nesting of a discrete form of cultural competence as with the mnemonic or the evidence hierarchy. It is not until Martin makes his pivotal voyage to St. Hubert that he finds himself under conditions in which such a need even becomes apparent, for only there does he have what is presumably his first interactions with black patients. It is also the occasion of his first collaboration with a black physician, Dr. Oliver Marchand. The entrance of black patients and Dr. Marchand compels the disclosure of Martin's own heretofore hidden racism. Martin's racist ideas hide not because they are a secret withheld for reasons of plot or suspense but rather because the situations traced by the novel thus far have not permitted it to emerge. The novel's silence on Martin's racism up to this point thus represents a formal nesting of institutional racism: since mainstream medical schools at the dawn of the Flexnerian enterprise did not accept black students, students like Martin would have had less opportunity to even know that they held views that could be considered racist. It takes Martin's voyage to a Caribbean island in order for racist sentiments to emerge.

The disclosure of Martin's racist views can be demarcated into three phases, each phase making the character assume increasing responsibility for revealing his racism. In the first phase, the narrative voice asserts an observation: "like most white Americans, Martin talked a great deal

about the inferiority of Negroes and had learned nothing whatever about them" (369). As a commentarial statement, the first phase contains the most indirect insight in that it renders an observation by drawing on aspects of Martin's life and character that presumably justify a charge of racism. There is indeed no previous scene in the novel in which Martin says anything about the inferiority of black people, so the narrative voice has to step in and manifest what is otherwise absent. The second phase involves free indirect discourse whereby the narrative voice presents, on Martin's behalf, a thought he had following a productive half-hour conversation with Dr. Marchand. Martin's thought equates Dr. Marchand with a "beautiful young animal." the focalization of Martin's thought in free indirect discourse offers relevant evidence taken directly from the subsequent scene, which, however, remains under a thick degree of narrative mediation. Martin does not actually say that Dr. Marchand is a beautiful young animal, but, by virtue of the narrative voice's access to his thoughts, the reader knows that he thinks it. In the final phase, Martin declares in dialogue "I never thought a Negro doctor – I wish people wouldn't keep showing me how much I don't know!" (370). The direct quote of dialogue further thins the degree of narrative mediation by cutting out the narrative voice entirely.

The presence of vulgar, tchotchke-like racism in both *Arrowsmith* and the cultural competence trainings raises considerable questions over the difference between the artistic ambitions of the former and the clinical ambitions of the latter. Adopting a perspective that regards aesthetic forms and pervasive and mundane forms nested inside one another forecloses the possibility of establishing any essential, categorical difference between the two types of texts. Yet the same scene in *Arrowsmith* involving Martin and Dr. Marchand shows what cultural competence training videos still cannot do: offer an alternative vision of what cultural competence strives for in patient care.

This alternative vision of cultural competence is theorized on the occasion of the two physicians first meeting. On this occasion, Dr. Marchand makes his way to care for quarantined families, which serves as a testament to the seriousness of the epidemic: "oh yes," Dr. Marchand explains to Martin, "in this crisis they permit a Negro doctor to practice even among the whites!" (Lewis 370). An arrangement in which members of a group cannot practice medicine among another group nests a "pattern that incorporates the experiences of [differentiation and stratification of humans along the lines of symbolic value attributed to phenotypical traits such as skin color]" (Frost 221). It is the effort to understand such patterns that presents an alternative to the stable configurations on which the cultural competence materials rely.

The scene goes on to move the consideration of this alternative vision of cultural competence from the periphery to the center of patient care. As the narrative voice observes, "for a half-hour did Dr. Arrowsmith and Dr. Marchand forgetting the plague, forgetting the *more* cruel plague of race-fear, draw diagrams" (Lewis 370 emphasis added). Likening race-fear to a plague – a word that, in a non-metaphorical deployment, would be reserved for the bacteria-induced crisis that Martin has come to vanquish – can be trivialized as a rhetorical flourish highlighting the seriousness of St. Hubert's racialized society. A metaphorical application of plague to race-fear would represent a way of borrowing some of the seriousness from the bacterial problem and transferring it to the social problem. Such a transfer would proceed from a situation of inequality between the two problems: the social problem starts as a less urgent problem and needs an unquestionably urgent crisis – a bacterial-induced crisis – to make it feel more urgent.

However, the qualification made for this second plague of race fear throws a wrench in this explanation. The fact that the narrative voice qualifies race-fear as the "crueler" of the two plagues negates the possibility that it is in need of rhetorical bolstering from the seriousness of a bacterial

crisis. A non-metaphorical of plague for race-fear makes it worthy of the same level of medical attention as that received by the bacteria-induced plague. As a disaster equally as serious, Martin's bacteriological expertise has nothing to give race-fear. Moreover, he does not wish to see what he does not know. By not wishing to see the racism in his own mind – the assumption that people with the phenotype of darker skin tone cannot be physicians – he is incapable dealing with the plague of race-fear. In this way, Martin reveals the holistic impulses of the understanding he lacks but with which Dr. Marchand forces him to reckon. These understandings attempt to expand a strictly biomedical understanding of health that would otherwise leave out race-fear as something deserving of medical attention.

CHAPTER 5: CONCLUSION – IMAGINING DISCIPLINARY RECONCILIATION FOR HOLISTIC HEALTHCARE

5.1 DOING, KNOWING, BEING

One of the great ironies of the Flexnerian enterprise was, its preeminent historian, Kenneth Ludmerer, tells us, assuming rather than proving the existence of harmony among research, patient care and medical education, the three once scattered activities it brought together. Viewed from a new formalist perspective, the subsequent destabilization of the enterprise's fragile equilibrium can be attributed to failure to appreciate the formal incompatibilities between the activities that constitute its three arms. One of the starkest incompatibilities lies in the rhythmic differences between the long, contemplative, lingering, sometimes groping dynamic of research, the often breakneck, sometimes forcedly linear, highly punctuated pace of patient care and finally the carefully regulated, cyclical nature of medical education. The implements used in the course of these activities also vary widely. Taken at face value, navigating electronic medical records does not look like navigating the intricacies of Institutional Review Board approval. Studying for exams in reference to learning objectives does not look like learning how to talk to patients from unfamiliar cultural backgrounds. The previous chapter attempted to bring these various implements together for the purpose of restoring them to a single plane, thereby establishing a precedent for studying them collectively while hopefully arriving at an understanding of how their patterns of use, systematicity and sentience of the object of study enact or afford disciplinary fragmentation. This chapter states this dissertation's answer to how the resulting understanding of disciplinary fragmentation is inimical to holistic healthcare before offering a vision for what disciplinary reconciliation might look like.

When understood as a function of three characteristics of subject-matter difference, disciplinary fragmentation is not just a function of the two categories into which these characteristics are split. The splitting of subject-matter difference into these three characteristics is itself fragmentary as well. The three dimensions along which the Biglan model classifies subject matter difference indeed affords a dubious distinction among three domains: doing, knowing and being. The respective poles of each dimension then further divide each of these three domains into two parts, as shown in the Table 4 below:

Table 4: Disciplinary fragmentation as a function of separating doing from knowing from being

Pole 1 of Dimension	**Three Domains Drawn by Three Dimensions of Subject Matter Difference**	**Pole 2 of Dimension**
Pure	**Doing**	Applied
Hard	**Knowing**	Soft
Life	**Being**	Nonlife

Setting aside the issue of how well the Biglan model describes the organization of the twenty-first century research university, it is far more important to consider how the casting of the model's three characteristics of subject matter difference as a dualistically splitting up doing, knowing and being extends these characteristics beyond questions of disciplinarity. So while critics may easily challenge the validity of the Biglan model to successfully classify the similarity of actual academic departments, especially those considered interdisciplinary, it would not be so easy to dismiss fundamental distinctions it draws between doing, knowing and being. Indeed, the far-reaching implications of these oppositions becomes clearer when expressed as the intractable opposition between self and other. Under the strictest, which is to say, entirely mutually exclusive categorical

disciplinarity, the pure can be regard as existing for itself, applied existing for the other; hard proceeds according to rules determined by others, soft proceeds according to self-determined rules; the self is alive, that which does not live is otherness (see Table 5 below).

Table 5: Disciplinary fragmentation as a function of separating doing from knowing from being and the Biglan oppositions as a function of self and other

Pole 1 of Dimensions	**Domain (Drawn by Three Dimensions)**	**Pole 2 of Dimensions**
Pure: Doing something for the sake of itself	**Doing**	Applied: Doing something for the sake of others
Hard: Knowing that relies on an impersonal, external system	**Knowing**	Soft: Knowing that relies on an idiosyncratic, internal system
Life: Being which has sentience	**Being**	Nonlife: Being which does not have sentience

However, the mutual constitution of doing, knowing and being makes it impossible to maintain the convenient mutually exclusivity of use, systematicity and sentience of the object of study posited by the Biglan model. Instead, these characteristics of subject matter difference, like doing, knowing and being, are mutually constitutive: *sentience shapes systematicity shapes use.* The forms of the Flexnerian enterprise elucidate how this mutual constitution operates to enact biomedicine. Biomedicine is the project that privileges the biological or physiological as the foundation of life, which helps to not only to justify these factors as the center of systematicity for the particular form of health care it prescribes but also to ensconce it as the ultimate form of health care. Per the exigencies of the resulting systematicity, anything that falls outside of biological or

physiological information is either not useful or useful only to the extent that it supports the capture of such information. Few if any Flexnerian forms, either examined or not by this dissertation, make this more obvious than the relative of the categories that organize the Electronic Medical Record. With the exception of the Social History section, along with, to a certain extent, the History of Present Illness and Past Medical History, all sections of the Electronic Medical Record are formally oriented around biological or physiological factors. It is for this reason that Smith's Patient Centered Interviewing has to make special mention of the Social History's usefulness in order to justify its existence in the medical interview. Yet under a paradigm that regards health as a function of such socio-political factors as a stable income or legal status, the information elicited in the social history is as useful, which is to say, has as much to do with health, as even the most pathologically relevant physiological change.

With the 1973 publication of the "The Need for a New Medical Model: A Challenge for Biomedicine," George Engel arguably sought to create such a paradigm with his biopsychosocial model, thereby attempting to establish systematicity for holistic healthcare that would make psychological and sociological information useful. With its Optimal Healing Environment, Integrative Medicine currently seeks to extend the biopsychosocial paradigm to include two sets of factors that Engel left out, the spiritual and the behavioral, thereby making those factors useful. Yet merely expanding the disciplinary scope does not achieve truly holistic healthcare, as chapter two's argument for disciplinary supplementation tried to show. As long as oppositions like the applied and pure, hard and soft, life and nonlife continue to divide use, systematicity and sentience, there will always be some measure of fragmentation and some aspect of health left out, thereby creating the need for the next supplement and deferring the achievement of complete and unbroken health care.

The mutual constitution of the Biglan categories revealed by the Flexnerian forms denies the possibility of categorical distinctness of cognitive styles that those very same categories tried to establish. The mutual constitution instead suggests the possibility of a recursive cognitive style, which is to say, a cognitive style that exists in the domain of difference-in-sameness. A recursive cognitive style does not deny the sheer existence of difference between doing that exists for itself and for others, between knowledge that relies on an external system and an internal one, between being that has sentience and does not. Rather, it asserts, as Pasteur suggested, that there is an indelible connection between them. In the search for this connection, a return to mind is necessary. The philosophical observations of another figure of biomedicine, Hermann von Helmholtz (1821-1894), corroborate this proposition:

> Mathematics and music, the most glaring possible opposites of human thought! And yet connected, mutually sustained. It is as if they would demonstrate the hidden [congruity] of all the actions of our mind, which in the revelations of [artistic] genius makes us perceive unconscious utterances of a mysteriously active intelligence.[11] (Helmholtz 46-7)

Written in the introduction to a lecture-turned-essay entitled "On the Physiological Causes of Harmony in Music" (1857), Helmholtz speculates on the existence of the "secret congruity of the mind" that achieves the spectacular feat of finding interconnection between what the systematicity dimension of the Biglan model might respectively carve up into soft and hard: music and mathematics, artistic genius and rationality.

Per Helmholtz's speculations, this hard-soft reconciling secret congruity is a function of mathematics and music. There is at once a considerable mystery and puzzling importance

[11] Mathematik und Musik, der schärfste Gegensatz geistiger Thätigkeit, den man auffinden kann, und doch verbunden, sich unterstützend, als wollten sie die geheime Konsequenz nachweisen, die sich durch alle Thätigkeiten unseres Geistes hinzieht, und die auch in den Offenbarungen des künstlerischen Genius uns unbewusste Aeusserungen geheimnissvoll wirkender Vernunftmässigkeit ahnen lässt (Helmholtz 122).

attributed to these two endeavors, making their point of intersection an intriguing location at which possibly to discover something as paradoxical as a reconciling, secret congruity of the mind. Despite serving as "an integral part of man's intellectual training and heritage for at least twenty-five hundred years," mathematics boasts a confounding distinction: "no general agreement has been reached as to the nature of the subject, nor has any universally acceptable definition been given for it" (Boyer 1). As for music's confounding importance, anthropologist Claude Levi-Strauss asserts that as the "only language at once *intelligible* and *untranslatable,*"[12] it is "the supreme mystery of the science of man, a mystery that all the various disciplines come up against and which holds the key to their progress" (Lévi-Strauss 18).[13] The paradoxically undefined importance of music and mathematics leaves ample room to imagine that they somehow grant access to something as eccentric as a reconciling cognitive style that might, among other things, make disciplined holistic healthcare possible.

A reconciling cognitive style must be distinguished from totalizing theory that relates knowledge from various disciplines. It would not be a unified mathesis universalis like the one that General Systems Theory tried to construct and from which Engel's biopsychosocial model sought to derive its methodological justification. Nor would it be a unified field theory that, like Integral Physiology, seeks to integrate the various forms of energy theorized and empirically validated by so-called Western science and the subtle energy posited by various so-called Eastern healing traditions. Nevertheless, it does acknowledge that systems theorists may have been on to something when they started thinking about disciplinarity in a formal mode. To be sure, the promise of thinking in a formal mode a strict foundered under the adherence to a strict

[12] La seule langue à la fois intelligible et intraduisible (Lévi-Strauss 26)
[13] Le suprême mystère des sciences de l'homme, celui contre lequel elles butent, et qui garde la clé de leur progrès (Lévi-Strauss 26)

mathematical formalism that sought to find completeness and rigor in a formal system of systems, or a truth-generating mechanism built from axioms expressing general system properties. Formal thinking foundered under the attempt to build a mathesis universalis that would use formal uniformities between disciplines to serve as a gestalt. The development of a reconciling cognitive style amounts instead to further articulating what role form plays in the secret congruity of the mind.

The formalism endeavoring to articulate this reconciling cognitive style takes as its definition of form the broadest imaginable definition – arrangement of elements – and folds that definition over on itself. When folded over on itself, this definition of form is no longer an immaterial 'putting-together' of material constituents; rather arrangement is an expanded element; element is a bracketed arrangement. It is for this reason that reconciling cognitive style and the formalism that attempts to articulate it would be called recursive. Element and arrangement are differently-the-same, thereby putting form in the paradoxicality of the recursive domain. Reimagined from recursive formalism, medical education, patient care and research would also become somewhat paradoxical endeavors, not least because they cease to be the discrete arms that their establishment under the Flexnerian enterprise required them to be. Grounded by a rethinking of each of the three pervasive and mundane forms discussed in the previous chapter, the following three sections imagine what the three arms would look like from the perspective of recursive formalism. Accessing this secret congruity of the mind proceeds only by changing forms that govern not only the activities of research, patient care and medical education but also those of the mind, making holistic healthcare possible.

5.2 RECURSIVE PATIENT CARE: NO PATIENT IS NEW, NO PATIENT IS NOT NEW

As the preeminent healing tradition of Western modernity, biomedicine is the project that searches for the universal characteristics of disease. Both narrative and schema-based medicine evoke as much when they distinguish between nomological, law-based or universal knowledge and the various narrative practices they recommend to healthcare providers to help them arrive at the singular. By such distinctions, patients are split into two parts, one part constituting difference and one part constituting sameness. The biological substrate of the disease constitutes the sameness, the story surrounding the illness constitutes their difference. In her praxiography of atherosclerosis, however, Mol reveals how the biological becomes the site of difference in manner unsettling to the universalist aspirations of biomedical theory. This revelation emerges through the testimony of a physician she meets in the course of her research. The physician explains:

> You [referring to Mol], since you're so interested in atherosclerosis, you should have been here last week. We had this patient, a woman in her seventies. She had renal problems. Severe ones, too. So she was admitted. And the next day she died. Paff, from one moment to the next. The nephrologists were aghast, and so, of course, was her family. So we were asked to do an obduction. It was unbelievable. Her entire vascular system was atherosclerotic. One of her renal arteries was closed off, the other almost. It was a wonder her kidneys still did anything at all. It was hard to see where they got their blood from. And it was more or less the same for every other artery we took out: they were all calcified. Carotids, coronary arteries, iliac arteries: everything. Thick intimas, small lumens. And she'd never complained. Nothing. No chest pain, no claudication, nothing. We phoned her general practitioner just to check it. He said she'd been visiting him for coughs and things.

> High blood pressure. But not with any complaint that make him think of atherosclerosis. (45-6)

In a confirmation of Engel's fundamental thesis that biological indices neither occupy the preeminent role of ultimate disease criterion nor exhaust clinical variability,[14] the presence of atherosclerosis' major somatic defect – major deposits of plaque on the vascular intimas – did not even trigger deliberation over, let alone a diagnosis of, atherosclerosis for the patient in her seventies. This patient had plaque that, in accordance with the theories of histology, which is to say, the biomedical science of tissues, did accumulate in her vascular system, but this accumulation did not ground a diagnosis of atherosclerosis. As such, this woman's atherosclerotic plaque was, from a clinical perspective, different. In other words, this woman's atherosclerotic plaque was not the atherosclerotic plaque that became the biological substrate grounding a diagnosis of atherosclerosis.

Conversely, the illness narratives can be a site of sameness. In her assessment of narrative medicine, Mariam Solomon devotes an entire section in *Making Medical Knowledge* (2015) to implicitly debunking one of its hallmarks, namely, the notion that narrative grants access to singular difference. Entitled "Narratives are not entirely singular," this section explains the proliferation of narrative sameness by dint of repeated tropes and narrative classification schemes. Repeated tropes include those surrounding breast cancer narratives. As for narrative classification, Solomon cites sociologist Arthur Frank's attempt in *The Wounded Storyteller* to schematize three basic illness narratives. Together, these and other examples help to establish that narrative cannot always be considered the gateway to difference. In face of the untenable attempts to resolve the patient into different and same 'bins,' recursive patient care rejects any further attempt to do so by

[14] See chapter 2, page 6.

recognizing that while elements like atherosclerotic plaque or the very words that comprise a narrative may recur again and again, the variables that govern the arrangement of these elements in the flat plane of formal collisions are so enormous that no two patients will ever be alike. In short, patients can only be differently-the-same.

In accordance with the corresponding recursive dictum that no patient is new, no patient is not new, there could not be the rigidly fixed categories of the Electronic Medical Record. Yet having no structure for charting is just as undesirable as having too rigid a structure. Sitting in the middle of these two undesirable poles is the possibility of creatively and spontaneously creating a structure. The disciplinary constraint arises not from an external system, like a strict outline, but rather from the contingent tensions between what the physician sees, knows and intuits and what the patient sees, knows and intuits. From this tension, the structure of a patient chart emerges. At the start of this emergence of structure, nothing is initially left out. As such, the need for a distinct set of skills like cultural competence vanishes. Rather than some pure catalogue that relates racial or cultural categories with potential obstacles to the successful application of biomedical techniques, culture instead becomes another arrangement of elements with which to contend. With the loss of any distinctions goes any sufficient ground for evidence hierarchies to distinguish between health care questions that merit evidence-grading and those that do not, thereby spurring research efforts to study health literacy interventions as much as drug interactions for diabetes.

5.3 RECURSIVE MEDICAL EDUCATION: LEARNING KNOWLEDGE WHILE CRITIQUING KNOWLEDGE

Under the terms of representationalism, which posits knowledge as representational pictures of reality, medical education is the process of aligning students with the pictures articulated by biomedical research. As such, education becomes a function of words, knowers and things, what Karan Barad calls the Representationalist triad. Students are the knowers who rely on words, the preeminent, yet unobtrusive entities through which the things of health identified and articulated by biomedical research – pathways, molecules, structures – become known. In her praxiographic analysis, Mol offers a different understanding of knowledge: "knowledge," Mol writes, "is no longer treated as referential, as a set of statements about reality, but as a practice that interferes with other practices" (153). Viewed from this perspective, the paradox of learning knowledge while critiquing knowledge becomes possible.

A glimpse of what of learning knowledge while critiquing knowledge might look like emerges with Linda Costanzo's critique of the Mean Arterial Pressure equation. Costanzo includes as part of her discussion of the MAP equation an observation that the equation can deceive, which in turn opens up philosophical questions about equations and what exactly they do. Not only does this merely disturb the tidy representationalist triad of words, knowers and things, but it calls into question the legitimacy of learning objectives, which, by their use of the imperative verb tense and other directive formulations, leave little room for, or at least do nothing to guide the student towards, anything other than rote obedience. The equivalent of learning objectives for recursive medical education would instead invite a critical stance. The official mission of written medical school exams of recursive medical education would in turn test the ability to not only use

knowledge but to critique it as well. The USMLE board exams, particularly STEP 1, would thus be freed from its need to strike a balance between questions that test knowledge of "immediate clinical use" and knowledge necessary for "lifelong learning." For learning knowledge while critiquing knowledge reconciles the two. Of course, the task of actually writing such questions or tasks looms large, but it would certainly draw on a creativity not commonly associated with writing test questions. As for the Objective Standardized Clinical Examination (OSCE), the opportunities for critique could be even more pronounced than in the written questions. Exploiting the exigencies of standardization that, among other things, require that the simulated patients follow scripts, one of the ways to introduce a critical component into the experience would be to instruct the simulated patients to ad lib or try to deceive in a way that neither the student nor the test administrators would be expecting. Doing so would afford the student the opportunity to examine the interplay between the information standardized patients were told to impart and that which they came up with, thus amounting to a critical understanding of the OSCE form itself.

5.4 RECURSIVE RESEARCH: HEALTHCARE-CHANGING FORMAL PLAY

As if to confirm Louis Pasteur's fears over distinguishing *sciences théoriques* from *sciences appliqués*, Mariam Solomon's assessment of the rise of translational medicine in *Making Medical Knowledge* (2015) identifies it as a response to the gap between the applied and pure. Translational medicine is the effort to address disappointing failures of major research like the Human Genome Project to deliver major medical interventions, what some researchers jocularly refer to as the "valley of death." In turn, the "valley of death," Solomon writes, "is blamed on the 'gap' between basic and applied research" (161). However, Pasteur's preferred thinking on research and its uses

dissolves the gap, and with it, the valley of death. From the perspective of Pasteur's belief not in *sciences appliquées* or *sciences théoriques* but in science and applications of science, the problem to which translational medicine responds is given as a response has one of two explanations: the proper manipulation of the research that extends it beyond itself has not been discovered or, more disconcertingly, the research arm of the Flexnerian enterprise has simply stopped doing research that lends itself to anything beyond itself.

Reflecting on the latter explanation, it may be that one of the conceptual tools of biomedicine – the mechanism – has run its course, which is to say, mechanistic thinking has nothing left to render, just as, per the terms of Pasteur's organic metaphor for the bond between science and applications of science, a plot of earth may no longer render fruit. In the search for how to arrive at new conceptual tools, it may be helpful to turn to the area of contemporary biomedicine that has perhaps the greatest need for reality-changing concepts: psychiatry. In *Of Two Minds* (2000), an ethnography of the psychiatric residency, anthropologist T.M. Luhrmann observes the practice of "psychiatric scientific play, linking unconventional ideas together and then seeing which are foolish and which are powerful" (Luhrmann 170). One evocative illustration of this play comes from a clinical researcher, Jonathon Cole, whom Luhrmann observes:

> "Play with the data," I [Luhrmann] once heard Cole say to a much younger colleague. "Play with it until something interesting emerges." He seems to chop standard categories apart and lump the segregated pieces together in unexpected ways: What (for example) are the differences between schizophrenia and dissociation when it comes to hearing voices? Will the ways in which the two disorders respond to medication tell you anything? (169-70)

The formality of the play Cole describes typifies recursive research, establishing a relation, or more precisely, works to dissolve the gap between the systematicity of given categories and the idiosyncrasy of discovering alternative categories.

Though it gestures to the playful formality of scientific knowledge that already exists by emphasizing the necessity of closely reading and interpreting potentially deceptive equations, Linda Costanzo's *Physiology* textbook does not extend that same service to knowledge that has yet to exist. To consolidate the paradigm of the research from which it is derived, medical textbooks erase formal play in the creation of that paradigm. Costanzo's historical sketch of the experiments that helped establish the Law of the Heart do not do justice to the formal creativity of Starling's heart-lung preparation, failing to give the least impression of the risk-taking synthesis that required not only a willingness to integrate austere biophysics-inflected research but research in difficult prose written in a foreign language. Moreover, as Starling reveals in his Linacre lecture of 1915, the pursuit of this research would not have occurred if he had followed what was considered useful under the medical paradigm coinciding with his research. The elision of this crucial fact from a textbook that relied on that very risk amounts to cutting research off at its feet. If the guidelines of two peer-reviewed journals – *Toxicology* and *Applied Toxicology* – are any indication, potential use is also a preeminent consideration in what research gets published, even if doing so would firmly ensconce research in a particular paradigm that does not achieve anything beyond its own goals.

Thus, the role of paradigms does not merely affect researchers but actively determines what healthcare providers can and cannot do for their patients. Chief among these health care-influencing paradigms are those that determine what life is. Institutional Review Board Guidelines bluntly rely on a concept of life that reduces it to a simple either-or proposition. Skirting direct

engagement with the question of what living means, IRB guidelines establish that either a research subject is living or it is not. Such is the limitation, perhaps, of a strictly materialist and mechanical conception of life. A promising, alternative conception of life and potentially mind is theoretical biologist Rupert Sheldrake's formative causation. The centerpiece of Sheldrake's theory is the morphogenetic fields, a concept going back to the 1920s that argues field-like forces help render the characteristic form that animals, humans, insects and plants exhibit, bringing the well-researched energetic forces that underlie matter closer to the liveliness of these creatures. Morphogenetic fields in turn cast the principles articulated by biomedical research not as laws of nature but as habits. Unsurprisingly, Sheldrake's theories have received much resistance from the mainstream scientific community, a startling indication of which is the removal of Sheldrake's 2013 TED talk from the TED collection on the grounds that it peddled pseudo-science. Regardless of the extent to which morphogenetic fields represent viable alternative to the mechanistic conceptual scheme of biomedicine, the dream of disciplined holistic health care represents an opportunity to follow Sheldrake's lead and at least contemplate an alternative to the strictly biomedical understanding of life and health.

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